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APPRAISAL OF

A FIRST PORT PROJECT

KOREA

May 29, 1973

Asia Projects Department

CURRENCY EQUIVALENTS

Currency Unit	=	Won
US$1	=	Won 400
Won 100	=	US$0.25
Won 1,000,000	=	US$2,500

ABBREVIATIONS

BMPU	-	Busan Mukho Project Unit
EPB	-	Economic Planning Board
GNP	-	Gross National Product
GRT	-	Gross Registered Ton
KNR	-	Korean National Railways
KPA	-	Korean Port Authority
LWOST	-	Low Water Ordinary Spring Tide
MOC	-	Ministry of Construction
MOF	-	Ministry of Finance
MOT	-	Ministry of Transport
Study Group	-	Lyon Associates (USA) & Economic Intelligence Unit (UK)
TPO	-	Transport Planning Office
Port Units	-	Authorities for Individual Ports under KPA

FISCAL YEAR

January 1 - December 31

N.B. All depths of water given in this report are below LWOST.

KOREA

FIRST PORT PROJECT

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SUMMARY AND CONCLUSIONS

i. A UNDP-financed study of Korea's 17 first class [1/] ports, completed by Lyon Associates (USA) and Economic Intelligence Unit (UK) in November 1972, has reviewed port traffic developments and concluded that containerization will develop rapidly and that methods of handling dry bulk cargo need to be improved. A first phase development was recommended for Busan and Mukho as part of the 1972-76 Development Program. The need to change the present organization of Korean ports was also emphasized.

ii. Korea's 17 first class ports, including the proposed project ports, Busan and Mukho, are presently operated under two independent bureaus in the Ministries of Transport (MOT) and Construction (MOC) which broadly cover the ports' operations and finances, and their development, construction and maintenance. Additionally, the Customs Department of the Ministry of Finance (MOF) is closely involved in port operations. Budgets and expenditures are controlled by the Government's Economic Planning Board (EPB). In practice there is little control of operations, and too many operators are involved in cargo movements, resulting in a low throughput capacity of the ports, especially Busan. Development proposals are not always responsive to port requirements and present financial arrangements are inadequate.

iii. A Korean Port Authority (KPA) will be set up by June 1, 1975 with jurisdiction initially over Busan and Mukho. By January 1, 1976 this jurisdiction will be extended to four other ports, and by 1978 to all Korean first class ports. Port Units will be established to manage each of these ports. KPA will report to the Minister of Transport who will approve the operational budget which it prepares and the tariffs it proposes to finance its operations. KPA will have the same autonomy as Korean statutory corporations and, through its Port Units, be solely responsible for controlling cargo and shipping movements. On January 1, 1974 a Busan-Mukho Project Unit (BMPU) will be established to carry out the project and control Busan and Mukho until KPA is established; it will be staffed from existing MOC and MOT units and report to MOT. Until January 1, 1974 the preliminary phases of the project will be carried out by MOT.

iv. The project, estimated to cost US$131 million, covers the proposals in the 1972-76 Development Program for Busan and Mukho and will meet traffic requirements of these ports up to about 1986 by providing:

In Busan:

(a) a composite pier to handle containers and grain, with storage silos, appropriate equipment and necessary dredging;

1/ Korea has designated its major ports as first or second class.

(b) a dry bulk cargo-handling pier with integrated bulk-handling systems, and necessary dredging;

(c) international (Korea-Japan) and coastal ferry terminals;

(d) rehabilitation of existing general cargo berths;

(e) a new military berth to be financed in total by the Government;

In Mukho:

(f) improvements to the coal-handling piers and the mechanical loading system;

(g) improvements to the existing breakwater;

(h) minor improvements to general cargo and cement berths;

Consulting Services and Technical Assistance:

(i) consulting services for the detailed engineering and construction supervision of the above works; the determination of future development requirements. Technical assistance to assist in establishing KPA and training some of its personnel.

The proposed Bank loan of US$80 million will finance the estimated foreign exchange cost of all civil works, mechanical equipment and consulting services except those involved in constructing the military berth at Busan. The Government of Korea will finance the local currency cost, estimated at US$43.5 million, and the foreign exchange cost of the military berth (US$7.5 million) for a total of US$51 million. The Bank loan will be to the Government of Korea which will be responsible for project execution with the assistance of consultants.

v. With improvement in operational procedures under the new organization and the development of containerization foreseen in Korea, no new general cargo berths will be required at Busan and Mukho and lighterage will be eliminated.

vi. Civil works and mechanical equipment procurement contracts will be awarded on the basis of international competitive bidding.

vii. The proposed project will earn an economic return of 32% calculated in terms of the measurable direct economic benefits to the Korean economy. The separately identifiable parts of the project will produce returns ranging from 20% to 32%, which have been established conservatively on the basis of a 20-year benefit stream, 1977-96.

viii. KPA will institute by January 1976 a cost-based tariff adequate to produce revenue sufficient to meet its requirements and BMPU will apply agreed interim financial measures by January 1974.

ix. The proposed project provides a suitable basis for a Bank loan of US$80 million to the Government of Korea for a term of 25 years, including a five-year grace period, reflecting the average economic life of the assets.

KOREA

APPRAISAL OF A FIRST PORT PROJECT

I. INTRODUCTION

1.01 The Government of Korea has requested the Bank to assist in financing improvements to the ports of Busan and Mukho which would consist of new facilities for containers, dry bulk cargo handling and an international ferry at Busan, and improvements to coal handling facilities at Mukho, together with ancillary works, and some rehabilitation of existing general cargo berths at both ports. The proposed project is based on a UNDP-financed and Bank-supervised study by Lyon Associates Inc. (USA) in association with the Economic Intelligence Unit (UK) (the Study Group) which drew up master plans for the development of these two ports and Korea's 15 other first class ports. The study was completed in November 1972.

1.02 The total cost of the proposed project would be US$131 million. The proposed loan for US$80 million would cover the foreign exchange component of all project items except those pertaining to the construction of a new military berth, to be financed by the Government. The loan would be to the Government for a period of 25 years including a five-year grace period, reflecting the average economic life of the assets.

1.03 There has been no previous Port Loan to Korea; for Railways there have been two Credits (25-KO and 110-KO), one Credit/Loan (183/669-KO) and one Loan (863-KO). There has been one Loan for Highways (769-KO). Experience on these transport loans has been satisfactory except as regards transport coordination (paras 2.10-2.12).

1.04 This report is based on the report of the Study Group and the findings of an appraisal mission composed of Messrs. F. Higginbottom (engineer), J.A. McCunniff (financial analyst - consultant) and O. Rahkonen (economist) which visited Korea in November/December 1972. The mission was assisted in the field by the Project Manager and Chief Economist of the Study Group.

II. BACKGROUND

A. Economic Setting

2.01 Korea's GNP grew at an average annual rate of 11.7% between 1965 and 1971, and GNP per capita by 9.7% to reach US$280 in 1971. This rapid economic expansion has been led by industrial development and the export of manufactured goods. Investment increased from 11% of GNP in 1960 to 25% in 1971, while the share of exports in GNP went up from 4% in 1960 to 25% in 1971.

2.02 According to a recent Bank economic report on Korea [1/], economic development is expected to continue at 8.6% annually during the Third Plan period 1972-76. The Third Plan emphasizes stabilization of the economy, reduction in the dependence on external savings for investments, and a moderation in the growth rate of most national aggregates other than exports.

B. Transport Sector

2.03 The rapid economic expansion in Korea during the 1960's has been accompanied by growing transport demand. Domestic passenger traffic (pass-km) in all modes increased by about 11% annually, domestic freight traffic (ton-km) by about 13% and international freight traffic by 22%. But due to relatively modest investments over the period 1962-66, the overall transport system capacity was severely strained. The situation improved during the second Five-Year Plan period, with investments in railways and highways, as well as road transport and coastal shipping. Transport capacity still needs to be augmented, however. Annex 1 presents the main features of the various modes of transport.

2.04 The 1962-71 growth of traffic in each mode is shown in Table 1. Railways have been handling substantial quantities of bulk, industrial commodities, and passenger traffic, although their share of total traffic has been decreasing. Road transport has the largest share of passenger traffic (71% in 1971) and has captured the bulk of this traffic's increase. Of the total freight traffic (ton-km) increase, 40% accrued to coastal shipping, 34% to railways and 26% to highways. There was a spectacular growth in port traffic, due mainly to increases in imports of oil, grain and lumber and in coastal cargoes such as fuel, coal and cement.

2.05 Road transport is characterized by the limited length of paved roads (10% of the total) and the relatively small number of motor vehicles (Annex 1). Most roads are poorly designed gravel or earth roads. The limited paving is due to the low priority given to roads until 1968 and concentration on the toll expressways: Seoul-Busan (428 km) and Seoul-Inchon (29.5 km).

2.06 In 1962, Korean National Railways (KNR) carried 87% and 51% of total freight (ton-km) and passenger (pass-km) traffic respectively; by 1971 these had decreased to 49% and 27%. KNR will, however, continue to carry large quantities of bulk commodities (notably coal, cement and oil) as well as significant passenger traffic. The capital, Seoul, is in urgent need of a mass rapid transit system. For this purpose, and to improve freight traffic services, KNR is electrifying the Seoul suburban and the main industrial lines.

1/ The Economic Situation and Prospects of the Republic of Korea, Report No. EAP-33a, November 3, 1972.

2.07 The expansion of port traffic has been larger than that applicable to any other transport facility. In 1962 total freight handled was 7.5 million tons; in 1971 it was 51.0 million tons (Table 1). This growth is mainly due to the expansion of foreign trade (Table 1), but there is a similar trend for coastal trade which amounted to about 30% of total domestic traffic (ton-km) in 1971, compared with about 5% in 1962. This rapid traffic growth has resulted in port capacity problems, which threaten to become more serious in future with the expected continued growth (para 5.04).

2.08 Korea's share of the merchant shipping tonnage handling Korea traffic was a relatively modest 21% in 1971, about the same as in 1962. In fact, the share has decreased from a high of 25% in 1969/70, indicating a shortage of Korean tonnage; this is being alleviated with Bank (DFC) participation.

2.09 Air transport is comparatively unimportant. The privately owned Korean Airlines provides domestic and some international flights; Korea is also served by other international airlines. Most traffic is handled at Seoul International Airport. Air freight traffic is minor.

C. Transport Investment and Coordination

2.10 Recognizing the inadequacy of investments in transport during the first Five-Year Plan period, which created transport bottlenecks, Government increased the transport allocation in the second Five-Year Plan (1967-71) to about 26% of the total capital formation. However, the use of funds was not always in accordance with economic priority. Transport planning and coordination have been inadequate, and responsibility scattered; MOC has been responsible for road and port construction, and MOT for airports, the railways, shipping and road transport regulations. The Economic Planning Board (EPB) has been the only organization in a position to coordinate transport investments, but it has not been staffed for this purpose. Annex 2 describes the functions of the agencies related to the transport sector, and the events leading to each organization's creation.

2.11. About the end of 1969, the Government set up a three-tier organization responsible for transport planning and coordination: the Transport Coordination Ministers Conference, the Transport Coordination Working Group and the Transport Planning Office (TPO) within MOT. However, substantive issues relating to investment planning and policy measures have not received adequate attention (Annex 2).

2.12 This matter, which was dealt with in the Fourth Railway Loan, signed in November 1972, requires continuous attention, as discussions between the Bank and relevant agencies indicates that transport coordination still receives relatively little attention by the Government. During loan negotiations confirmation was obtained that the action program agreed in the Fourth Railway Loan is proceeding on schedule.

III. PORT FACILITIES, ORGANIZATION AND OPERATIONS

A. Existing Facilities

3.01 The existing facilities at the project ports are generally unsatisfactory for efficient operations. Quay aprons are narrow, the existing paving poor, and lighting inadequate; maintenance is unsatisfactory.

(1) Busan (Map No. 2)

3.02 This is Korea's most important port and except for oil traffic, it handled 35% of all Korean cargo in 1971. It has a natural harbor, further protected by breakwaters, with commercial (Northern) and fishing (Southern) sections. The entrance channel has 12 m depth of water (40,000 dwt ships). Maximum tidal range is 1.2 m.

3.03 About 4,100 m berthage (Table 2) is available at four finger piers and a central wharf; depth of water alongside is between 8.0 m and 10.2 m (max. 15,000 dwt ships). Pier 3 (920 m) and part of the central wharf (190 m) are used exclusively for military traffic, which restricts movement inside the Customs fence. Oil traffic, mostly coastal, is handled in the outer harbor. There are about 3,000 m of lighterage wharf and 25 ship anchorages with 5 to 13 m depth. Adequate privately-owned lighters and tugs are available; MOT has four ship-handling tugs. Container traffic is handled with ships' own gear at the existing piers, by landing containers directly onto semi-trailers. The process is slow.

3.04 There are 18 transit sheds with 48,000 m^2 of floor area located on the piers; they have no electricity or water, and all are in need of maintenance. Open storage available is about 125,000 m^2, some 15% of which is paved. A total of 90 private warehouses are available outside the port area 77 of which (72,000 m^2 floor area) are bonded; they have no electricity.

3.05 Electricity and water are available on the piers, but lighting is inadequate for night work. Maintenance is very poor, and rubbish needs to be removed. Rail tracks and roads within the port are generally adequate, but their standard of maintenance is poor.

3.06 There is one pneumatic grain unloader on lighter Wharf No. 7 which feeds six private grain silos (10,000 ton total capacity). On Pier 4 there is a cement handling system with two privately owned 10,000 ton silos; the system is fed from specialized bulk cement ships with pneumatic unloaders. Mechanical general-cargo-handling equipment is mostly privately owned (Table 3).

(2) Mukho (Map No. 3)

3.07 Mukho is essentially a bulk coal and cement port, although some general cargo is handled, and it is the base for a large fishing fleet. The harbor is artificial, enclosed by two breakwaters, with a 9.5 m deep entrance

(10,000 dwt ships). Maximum tidal range is 0.2 m. Wave heights up to 0.9 m maximum are experienced inside the harbor, and 0.5 m waves are common. Presently the harbor is unusable some 15-25 days per annum.

3.08 Berths available are (i) coal Piers A and B providing 87 m and 100 m berths with 6.5 m and 8.0 m alongside respectively (max. 8,000 dwt ships), but foundation design forces ships to be moored off the berths, (ii) a 330 m cement and clinker wharf with 9.5 m water (10,000 dwt ships) and (iii) 130 m general cargo berth with 7.0 m alongside (6,000 dwt ships). A further 130 m general cargo berth is under construction. Berth aprons are adequate. There are two transit sheds and six warehouses, the latter for fisheries. Maintenance is generally poor.

3.09 Coal is delivered by elevated rail track into a 16 ha storage area and conveyed by mechanical conveyors to mechanical loaders with fixed arms on Piers A and B. The system's theoretical capacity is 600 tons/hr, but difficulties in feeding the conveyors limit it to about 200 tons/hr.

3.10 For cement, also delivered by rail, there are three 10,000 ton capacity silos and one of 10,000 ton capacity for clinker. Loading is by pneumatic equipment (600 tons/hr) for cement and mechanical (300 tons/hr) for clinker. All these are owned by Ssang Yong Cement Co. and are well maintained. There are two forklift trucks and two cranes, privately owned, for general cargo.

B. Existing Organization, Planning, Finances and Procedures

(1) Organization

3.11 Korean ports are controlled by a number of agencies spread over different Ministries; Law No. 1941, Ports Act, of March 30, 1967 divides them into "designated ports" and "local ports". The 40 "designated ports" are further divided into 17 first class and 23 second class; the latter are operated by local government officials. The 17 first class ports (Table 4) are placed under the Bureau of Marine Transportation of MOT for operational and administrative control and under the Bureau of Harbor Development of MOC for design and construction; the Customs Department of MOF is involved in operations (para 3.14); port budgets are approved and controlled by EPB.

3.12 MOT operates through a headquarters organization in Seoul and nine Marine District Bureaus at port level charged with management of ports and direction of their use; safety, security, and navigation aids; licensing and supervision of port operators and pilots; operation of railways within the port area; and minor maintenance. The Hydrograpic and Communications Offices of MOT are also involved in port matters.

3.13 MOC has a headquarters organization in Seoul, supervising five Regional Bureaus and Harbor Construction sections; these in turn control 11 district port construction offices responsible for maintenance and repair

of the ports (by contract), dredging supervision, minor works design, cost estimates, letting and supervising of contracts, MOC survey vessels, and reclamation by private enterprise.

3.14 Annex 3 gives details of the organization and functions of MOT and MOC for ports.

3.15 The Customs Department collects customs and tonnage dues, inspects ships and cargoes, designates bonded areas, has custody of goods therein and controls cargo movement in the ports (Annex 4). Immigration, health, quarantine and police assistance are made available through the appropriate ministries.

3.16 This scattering of major port functions over three separate Government agencies, plus EPB's budget control, results in weak, uncoordinated management and adversely affects investment planning, finances, and operations, as noted below.

(2) Investment Planning

3.17 MOC gathers cargo movement data from MOT and the Customs Department, develops plans, and submits these to the Central Port Committee 1/ for consideration and finally to the Minister. EPB makes a budget evaluation and when this is approved by them and by the President of Korea, MOC executes the projects. Upon completion it is handed over to MOT. This process results in the effective exclusion of port operators' ideas, and the final product is unlikely to ensure efficient port working. Transportation coordination is poor (paras 2.10-2.12), and as a result port developments are often undertaken without full consideration of alternatives for handling particular traffic requirements. Proposals to change the procedures are discussed in section C of this chapter.

(3) Finances

3.18 The present financial control is unsatisfactory. It is organized more for Government budget requirements than to assist port management. Ports operate under budgets prepared by MOT and MOC and approved by EBP. Initial budget recommendations are sought at port level but the headquarters' sections responsible generally disregard these and use their own information. Inevitably, discussions and revisions take place between the original proposal and approval, but port staff is not kept informed. The result is a formalized budget which is not properly attuned to port requirements. Application of the budget allowance within each category is rigorously enforced and there is little room for maneuver if unexpected expenditure needs arise. Port charges (Chapter VI) are imposed by MOT, but are totally inadequate to cover expenditures and are not cost-based. Presently tariffs can only be revised with EPB's approval and increases are usually related more to national inflation control than to the ports' requirements (Chapter VI).

1/ In theory only; in fact this committee has never met (Annex 3(2)(d)).

(4) Existing Operations

3.19 MOT is nominally responsible for operations but in fact exercises little influence, and there are numerous organizations involved. Actual physical cargo movement is undertaken by private licensed operators. Details for Busan are in Annex 4. Currently Busan achieves a throughput of only about 550 tons per m of berth per year on the available commercial berths; this is low compared with other world ports where averages of about 850 tons per m are common. There is no actual ship waiting time in the sense of a queue of ships waiting, but this will develop if steps to improve the position are not taken. About 40% of existing traffic is handled by lighter; 70% of all ships were worked less than 50% of the total hours spent in port and half of these were worked at or below 30%. The reason for the low efficiency can be summarized as follows: (i) responsibility for handling cargo is fragmented and time and effort are wasted due to lack of coordination; (ii) mechanical equipment and pallets are often used only when human labor is incapable of the task; (iii) lighterage use is excessive and a significant number of ships unload at anchorage and then move to a berth for loading; (iv) transit sheds are often used as warehouses for long-term storage; (v) documentation is excessive; Customs, for example, use 22 separate forms, mostly to move items from one place to another within the port; and (vi) Customs often controls cargo disposition and movements within transit sheds.

C. Proposed Reorganization

3.20 Existing fragmented control of ports will be replaced by a Korean Port Authority (KPA) responsible to the Minister of Transport. KPA will be operative June 1, 1975 with responsibility for the two project ports, to be followed by Inchon, Kunsan, Masan, and Ulsan (the scheduled ports) on January 1, 1976, and the remaining first class ports by 1978, in accordance with the agreed plan of action in the Loan Agreement.

3.21 KPA's proposed structure is outlined in Table 5. Essentially, it will comprise a Director General and Deputy Director General with five main departments responsible for planning, technical services, operations, administration and finances, and with a separate internal audit section. A computerized data processing center is foreseen, but this should be formed only after KPA has gained operational and data collection experience, perhaps two years after formation of KPA.

3.22 KPA will be subject to policy directives of the Minister but will have independence and autonomy in its day-to-day operations similar to that of statutory corporations in Korea. KPA will prepare its budget and will have financial autonomy within the budget approved by MOT, subject only to advising the Minister of EPB of substantial changes within the budget. It will propose tariffs aimed at financing budget expenditures and the Government will make good any revenue losses arising from its failure to approve these tariffs.

3.23 The Director General will have the rank of Vice-Minister. He will advise the Minister on port matters and, in the Minister's absence, attend cabinet meetings on such matters. Department Heads and Directors of Port Units (para 3.26) will be appointed by the Director General subject to the Minister's approval. All other staff will be appointed by the Director General.

3.24 KPA will be responsible for (i) preparing port regulations, (ii) formulating long- and short-term development plans, (iii) statistical data collection and analysis, (iv) maintaining financial viability and methods of accounting, (v) maintaining design and technical support services, (vi) controlling inventory and purchases, (vii) formulating individual port budgets and tariffs, (viii) establishing uniform costing procedures and (ix) maintaining operational efficiency and documentation. The financial aspects involved for the project ports and for KPA are further detailed in Chapter VI.

3.25 The timetable for all necessary action to establish KPA, appoint financial, operational and management/documentation consultants (Annex 5) and introduce operating systems and procedures and new accounting methods will be in accordance with the agreed plan of action. The specialist consultants will train KPA's staff in the application of the new methods from mid-1975 to December 1976 except on specialized piers (para 4.02) where training will have to follow completion of the works (Annex 5).

3.26 Each of KPA's first class ports will have a Port Unit headed by a Port Director (Table 6). It may have sub-units to control adjacent ports. Port Units will essentially comprise technical, operational, and administrative sections. The functions of the Port Units and proposed operating methods are given in Annex 5.

3.27 The success of the advisory element of the specialist consultants' work (para 3.25) will depend upon the Port Unit Directors taking timely action on advice received. Any disputes at port level will be referred to the Director General for resolution in consultation with the consultants' Project Manager.

3.28 Pending the establishment of KPA, the Government has proposed and the Bank has agreed that a Busan-Mukho Project Unit (BMPU) will be formed not later than January 1, 1974 under MOT headed by a Director General (Grade I - Civil Service) and comprising staff from MOC and MOT as required. BMPU will, inter alia, be responsible for carrying out the project, operating the project ports until June 1, 1975, and preparing terms of reference for the specialist consultants (para 3.25) subject to approval by the Bank. Until January 1, 1974, MOT will be responsible for carrying out the project. Interim financial measures will be introduced by BMPU in January 1974 as described in Chapter VI. It is anticipated that a nucleus of KPA staff will come from this new bureau to ensure continuity. This is all set forth in the agreed plan of action.

IV. THE PROJECT

A. Korean Government Port Development Program

4.01 The Korean Government has prepared a Five-Year (1972-76) ports program totalling Won 91,400 million (US$228 million). This was more than the Study Group's recommendations by Won 19,300 million (US$48 million) although about Won 10,500 million (US$26 million) of the excess involves port developments at New Pohang to serve a proposed steel mill extension, a project not included in the Study Group's recommendations. The Government has now agreed to the Study Group's proposals except for a larger, Won 10,156 million (US$25.3 million) project at Inchon to be financed by Asian Development Bank (ADB). The agreed program is now US$186 million. Details of the Government and Study Group proposals are in Table 7.

B. The Project

4.02 The project covers the Government's 1972-76 program for the ports of Busan and Mukho, as proposed by the Study Group and amended following the Bank's review of the proposals. Specifically the project will comprise:

(a) At Busan:

(i) a composite pier with two 300 m container berths and a stacking area, and a 260 m grain berth with 70,000 ton storage silos; all necessary equipment for handling containers and unloading grain;

(ii) a bulk handling pier with one coal imports berth, two for ores and mineral exports, and one for scrap and heavy steel imports; appropriate cranes and bulk handling systems;

(iii) dredging to give a 13.5 m deep access channel, 10 m depth alongside (15,000 dwt ships) at the bulk pier and 12.5 m depth alongside (50,000 dwt and large modern container vessels) at the composite pier;

(iv) a new international ferry berth with passenger and roll-on/roll-off (ro-ro) traffic facilities on Pier 1 South; and rehabilitation of Pier 1 North for general cargo;

(v) coastal ferry berths with passenger facilities;

(vi) rehabilitation of Pier 2 for general cargo; and

(vii) a new military berth (not financed by the loan).

(b) At Mukho:

(i) new coal Piers A and B with improvements to existing conveyor systems, and new mechanical loaders;

(ii) a new belt/reclaimer system in the existing open storage area, for coal and limestone delivery to the pier conveyor system;

(iii) dredging at the new coal piers to give 8 m depth alongside (8,000 dwt ships);

(iv) raising the existing East breakwater to +5.0 m elevation and strengthening the side slopes; and

(v) rehabilitation of existing cement and general cargo berths.

(c) Consulting Services:

(i) for detailed design and supervision of construction of the above; and

(ii) to prepare a Phase II development plan for the first class ports.

(d) Technical Assistance:

to assist in formation of policies and procedures in connection with and for KPA, and on-the-job training of personnel in their application.

A detailed description of the project items is given in Annex 6 together with an indication of the capacity of Busan and Mukho on completion of the works.

4.03 The total estimated cost of the proposed project is Won 52,420 million (US$131 million equivalent) of which Won 35,000 million (US$87.5 million) is estimated to be foreign exchange; the proposed loan would be for Won 32,000 million (US$80 million) and would finance the foreign exchange cost of all works except the military berth. The project's local currency cost, Won 17,420 million, will be financed by the Government which will also finance the foreign exchange cost of the military wharf, Won 3,000 million equivalent. The Government has confirmed that the annual budget will include the cost of the military wharf construction and allowance for contingencies on the project.

4.04 Details of the cost estimates are given in Table 8 and summarized below:

Item	Won Equivalent (million) Local	Foreign	Total	US$ Equivalent ('000) Local	Foreign	Total	% of Total Cost
A. Civil Works							
Busan	9,070	17,043	26,113	22,670	42,610	65,280	55
Mukho	910	760	1,670	2,275	1,900	4,175	3
B. Mechanical							
Busan	530	4,644	5,174	1,325	11,610	12,935	11
Mukho	150	1,240	1,390	375	3,100	3,475	3
C. Final Design and Supervision	540	1,960	2,500	1,350	4,900	6,250	5
D. Development Study /1 Phase II	75	320	395	190	800	990	1
E. Technical Assistance for Proposed Port Authority and Personnel Training	65	480	545	160	1,200	1,360	1
F. Physical Contingencies	1,630	2,888	4,518	4,080	7,220	11,300	10
G. Price Contingencies	2,450	2,665	5,115	6,125	6,660	12,785	11
Subtotal	15,420	32,000	47,420	38,550	80,000	118,550	100
Military Wharf /2	2,000	3,000	5,000	5,000	7,500	12,500	
TOTAL	17,420	35,000	52,420	43,550	87,500	131,050	

/1 May be undertaken by UNDP subject to a Government request to UNDP.

/2 Government-financed.

4.05 The cost estimates for civil works are based on unit prices for similar works undertaken in Korea, or nearby countries, following preliminary engineering design, and are considered adequate in the light of experience on such works; estimates for mechanical equipment are based on recent purchases of similar items or current manufacturers' quotations. Physical contingencies have been calculated on the basis of 15% for civil works, and price contingencies at 6% per annum of foreign exchange costs and 10% per annum of local costs, to cover possible price increases from 1972. An allowance for the effect of recent currency realignments has been included in the estimated costs.

C. Project Execution

4.06 BMPU, to be formed on January 1, 1974 (para 3.28), will carry out the project with the assistance of consultants until KPA takes over in 1975. The initial stages will be supervised by MOT until January 1, 1974.

D. Consulting Services

4.07 Lyon Associates (USA) has been appointed by the Government for final design and construction supervision. Specialist consultants in the fields of port management/operations and port finances (para 3.25 and Annex 5) will be appointed to assist KPA and the Port Units and on-the-job training of personnel. Consultants will also be appointed for a Phase II development study of Korea's first class ports to conform with economic development forecasts to about 1985 (Annex 7).

4.08 UNDP has indicated a provisional interest in financing the proposed Phase II study with the Bank as executing agency, subject to the Government's application. The Government's intention in this matter is presently being clarified. In the event UNDP finances the study, the sum included for it in the project will be transferred to contingencies.

E. Procurement and Disbursement

4.09 The project will be executed under six civil engineering contracts, five mechanical equipment procurement contracts and a grain silo civil/mechanical contract (Table 9). All contracts will be awarded on the basis of international competitive bidding. The Government has indicated that no import duties will be levied on items required for the project. It is not likely that Korean industry will be able to supply any of the mechanical equipment required; however, provision has been made to allow a 15% preference for local manufacturers.

4.10 The works are expected to be completed by mid-1978, assuming effectiveness of the proposed loan by September 1973. Construction schedules for Busan and Mukho are in Tables 10 and 11.

4.11 Disbursement for the project civil works will be on the basis of 61% of total costs, representing the estimated foreign exchange component. If all civil works were let to Korean contractors, the foreign exchange component would be somewhat less, and up to US$7.2 million could be disbursed against local expenditures in this event. For consulting services and mechanical equipment procurement, disbursement will be on the basis of actual foreign exchange costs. Annual estimated project expenditure is shown in Table 12 and the estimated schedule of disbursements for the proposed Bank loan in Table 13.

F. Expenditure outside the Project

4.12 The Government's agreed program is US$68 million in addition to the proposed Bank-financed project at Busan and Mukho (para 4.01). During the project construction period, investment in any one port will not exceed that recommended by the Study Group, except for the ADB project at Inchon, US$25.3 million, or as the borrower and the Bank may otherwise agree.

G. Ecology, Urban Development and Employment

4.13 The proposed dredging and reclamation works at Busan would not affect the ecology of the harbor; none of the dredged material is to be dumped. None of the proposed works will affect any known urban development plan, and the increased container traffic should result in an eventual reduction in the total number of vehicles entering and leaving the port and should reduce traffic congestion.

4.14 Inevitably the introduction of bulk-handling methods at Busan and the increased efficiency at Mukho will reduce employment in the ports. Accordingly, recruitment to the existing labor force should be limited and reduction achieved by attrition. The specialist consultants will make specific proposals for handling this problem. It is expected that the growth in the area's economy will relieve the potential unemployment situation to some extent.

H. Future Development

4.15 Rehabilitation of Piers 3 and 4 and the Central Wharf, proposed by the Study Group and agreed to by the Bank, cannot be undertaken before the completion of the new military berth releases Pier 3 and the Central Wharf. Furthermore, Pier 4 will be used for container traffic pending completion of the composite pier. These rehabilitation works will be undertaken by KPA from mid-1977 to end-1978 at an estimated cost of US$3.9 million and Won 1,240 million.

4.16 A proposed study to determine the development requirements of other Korean ports in the light of the Government's industrial development proposals will be undertaken with the help of consultants (paras 4.07 and 4.08 and Annex 7).

V. TRAFFIC AND ECONOMIC EVALUATION

A. The Project and the Third Development Plan 1972-76

5.01 The proposed project, which is part of the Third Development Plan 1972-76, has been designed (i) to reduce cargo handling and shipping costs of existing exports, imports and coastal trade and (ii) to meet the requirements for increased port capacity resulting from implementation of the Third Plan. The Government's overall development objective is to achieve a sustained 8.6% annual GNP growth during the Plan period 1972-76. This growth rate is realistic (para 2.02). The 8.6% annual growth in GNP has been estimated to result in a continued rapid expansion of Korean foreign trade, exports by 27.0% p.a. and imports by 11.5% p.a. In addition, coastal shipments are expected to show a high growth rate due to industrial expansion and an increase in living standards which will generate a considerable demand for cement, fuels and coal, the main coastal commodities. The Third Plan recognizes the need for improvement of major ports, which in the past have received less attention than highways and railways, as an important part of the overall development strategy. The economic evaluation and traffic forecasts have been based on the assumption that the overall development targets will be achieved; the project has not been assumed to generate any development not presently included in the Third Plan.

B. Past and Present Traffic

5.02 During the period 1967-71, total cargo traffic through Busan port grew 13.8% p.a. from 6.5 million tons to 10.9 million tons. Cargo traffic through Mukho port grew during the same period from 1.7 million tons to 3.3 million tons or by 18.2% p.a. Details on shipping and past traffic development are provided in Annex 8 and Table 16; Table 14 gives shipping statistics; Table 15, combined ocean and coastal traffic.

5.03 At Busan, exports represented 2.0 million tons, or 18.3% of the total of 10.9 million tons handled in 1971; imports were 4.9 million tons (45.0%), and coastal shipping 4.0 million tons (36.7%) (Annex 8). General cargo represented 3.9 million tons (35.8%), while dry and liquid bulk amounted to 4.6 (42.2%) and 2.4 (22.0%) million tons, respectively. At Mukho, about 2.3 million tons (69.7%) represented dry bulk in coastal trade, while 0.7 million tons (21.2%) were exports of dry bulk; other cargoes were of minor importance.

C. Future Traffic Development

5.04 Details on future traffic development and containerization are provided in Annex 8 and Tables 17 to 20. The forecasts indicate that the total freight traffic at Busan will increase by 7.0% p.a. during 1972-86, while the corresponding growth for Mukho port is estimated at 8.6%. Exports are expected to increase at Busan to 4.3 million tons in 1986, or by 5.2% p.a; at Mukho exports will reach about 3.6 million tons, growing by 11.5% p.a. Imports will increase to 9.3 million tons (4.4% p.a.) at Busan but remain

unimportant at Mukho. Coastal shipments are expected to increase rapidly, and reach 16.5 and 7.6 million tons in 1986 for Busan and Mukho, respectively, corresponding to annual growth rates of 10.0% and 8.0%, mainly due to increased demand for fuels and cement.

5.05 Exports and imports of general cargo are being rapidly containerized (Annex 8) at Busan and this development is expected to continue at an annual growth rate of 19.0% and reach 3.8 million tons by 1986 when about 70% of the general cargo will be containerized at that port. In 1981, containerized cargo is estimated at 2.4 million tons with some 260,000 containers to be handled, including 56,000 on the international ferry berth. The volume of general cargo at Mukho is small and is not expected to show any significant future increase (Table 18). No containerization is anticipated for this port.

D. Economic Justification

(1) Calculation of Project Benefits

5.06 Project benefits have been calculated as the difference in directly quantifiable port user costs with and without the project; indirect benefits, if any, which may be induced within the non-port sector of the economy were not quantifiable and have been excluded. The benefits have been calculated separately by the following cost components: (i) cargo-handling costs in ports, (ii) costs of vessels in port and (iii) sea voyage costs. Cost reductions, which may accrue in foreign ports through the use of larger vessels and containers made possible by the improvements in the project ports, have not been taken into account.

5.07 In both project ports, the proposed investments consist of a combination of cost-reducing and capacity-increasing investments. Cost reductions will be obtained for existing traffic through improved cargo handling facilities. Increases in future user costs are avoided by investments in increased port capacity. Benefits have been calculated separately for both of these components. It has been assumed that benefits resulting from increased port capacity will accrue fully to the Korean economy because, without the project, the shipping lines (freight conferences) would impose surcharges, which would correspond to the increased ship waiting times in port; the costs for charter would similarly increase. On the other hand, benefits in the form of reduced costs to foreign carriers will be split between the Korean economy and these carriers. The benefits to the Korean economy will be recouped partly through the higher port charges which can be applied (Chapter VI) and partly through reduced shipping rates for bulk exports and imports (Annex 9). Benefits to Korean-flag vessels as well as reductions in cargo handling costs in the project ports will all come to the Korean economy. Coastal shipping is an integral part of the domestic economy and is carried out by Korean flag vessels only.

5.08 The calculation of economic benefits resulting from, and attributed to, the project investment has been detailed in Annex 9; the results of this evaluation are summarized below. Investment costs in each case include all

works involved and the cost of design and supervision, but exclude cost contingencies.

(2) Busan

5.09 The berth occupancy at Busan had reached a high level by 1971/72, but was combined with a low operational efficiency (Annex 4). A rapid increase in average ship waiting times is therefore to be expected if the present operating conditions continue. The present operating conditions have, however, not been used as a basis of comparison in calculation of the economic return, because an improvement in cargo handling rates is assumed to take place due to reorganization (Annex 5). The assumed operational improvement does not require any investments other than some maintenance dredging and rehabilitation of port facilities. The benefits have been calculated from this improved operational base.

(a) Composite Pier

5.10 The Composite Pier, to be completed by the end of 1977, will provide container and bulk grain handling facilities. The container facilities will relieve the general cargo piers, while the grain handling facilities will, together with Pier 7, replace the present uneconomic bulk handling by lighters and at berths.

5.11 The investment in the Composite Pier will in 1977 result in benefits to the Korean economy of US$2.73 per ton for grain (Table 21) and of US$6.40 per ton for containerized general cargo (Table 22). The total benefits in that year are calculated at US$8.41 million (Table 26).

5.12 The investment cost of the Composite Pier amounts to US$47.7 million equivalent. In calculation of the economic return, dredging cost required for deepening of the channel and port area - US$13.1 million - were distributed between the Composite Pier and Pier 7, and 60% has been added to the investment in the Composite Pier.

5.13 The first year return (FYR) will be 15.1% in 1977 on the basis of the benefits and costs above. This return is satisfactory.

(b) Pier No. 7

5.14 Pier No. 7, to be completed by the beginning of 1977, will provide facilities for bulk handling of coal, other minerals, ores, steel and scrap. This pier will, together with the Composite Pier, replace lighterage and centralize the handling of dry bulk cargo.

5.15 Benefits to the Korean economy are calculated at US$1.49 per ton for coal (Table 23) and US$1.03 per ton for other minerals, ores, steel and scrap (Table 24). Total benefits amount to US$3.67 million in 1977, the assumed year of completion of Pier 7 (Table 26).

5.16 The investment cost of Pier 7 is US$18.3 million equivalent. To this cost has been added US$5.2 million equivalent, representing the remaining 40% of the total dredging cost.

5.17 The FYR in 1977 will be 15.6%, which is satisfactory.

(c) International and Coastal Ferries

5.18 The international and coastal ferry terminals will be completed by the middle of 1976. The international ferry terminal will be used by roll-on/roll-off (ro-ro) ferries between Korea and Japan, which will mainly ship trailer-fitted containers, and thus complement the container facilities on the Composite Pier. In addition, the ro-ro ferries will serve a rapidly increasing passenger traffic (Table 16). The coastal ferry terminal will replace the existing facilities, which are scattered at various temporary locations within the port area. They provide mainly passenger services within Korean waters.

5.19 The savings in transport cost from the international ferry terminal are calculated to be US$4.84 per ton, and US$3.00 million total in 1977, for containerized cargo handled. As in the case of the container traffic over the Composite Pier, these savings will gradually increase due to increased future traffic. Details of benefit calculations are in Table 25 and Annex 9. The benefits of the coastal ferry terminal have been estimated at US$0.20 per passenger, resulting in US$0.48 million total for 1977. The estimate is conservative.

5.20 The investment cost in the international and coastal ferry terminal amounts to US$13.2 million equivalent, and the estimated US$3.48 million of benefits will give a high FYR of 26.4%.

(d) Total Project - Busan

5.21 The total project cost for the proposed works in Busan port amounts to US$94.1 million equivalent. The corresponding benefits in 1977 amount to US$15.6 million (Table 26), resulting in a satisfactory FYR of 16.5%. The corresponding economic rate of return is above 30% (Table 26).

(3) Mukho

5.22 Mukho is essentially a two-commodity port, with substantial shipments of coal and cement (Table 18). About 72% of the proposed works relate to the improvement of coal handling facilities, while the remaining part represents minor rehabilitation and dredging works and a major improvement of the breakwater. The economic evaluation of the project investment in Mukho port has been carried out in terms of the improvement of the coal handling facility only, and the other improvements have been included as associated improvements (Annex 9).

5.23 The improvement of the coal handling facilities will result in a saving of US$0.61 per ton in 1977, the total savings being US$1.38 million

(Table 26). The corresponding investment cost amounts to US$9.3 million. The FYR on this basis is 14.9% which is satisfactory. The economic rate of return is about 20%, calculated on a conservative basis.

(4) Economic Evaluation Summary

(a) First-Year Rate of Return (FYR)

5.24 The total project cost is US$103.4 million, excluding US$12.8 million in contingencies for price escalation and US$2.4 million for further studies and technical assistance. The corresponding project benefits are estimated at US$16.9 million in 1977 (Table 26), resulting in a FYR of 16.4%. The breakdown by main project components is provided in Table 26.

(b) Economic Return (ER)

5.25 The ER on the project investment has been calculated as 32% (Table 26), including benefits which are estimated to be obtained during the period 1977-96. Benefits have, however, been considered as constant after 1986; by that year the increased capacity provided by the project will be fully utilized and another capacity increase will be required. Further, the ER expresses the return to the Korean economy, because it excludes that part of the cost reductions (about 27% of the total in 1977) which is assumed to be retained by the foreign carriers and not passed on to the Korean economy (para 5.07, Annex 9 and Tables 21-25).

(c) Sensitivity of Economic Return

5.26 The project feasibility is marginally sensitive to changes in costs and benefits. In the case of a 15% increase in costs and a corresponding slippage in benefits, the ER would still be 27%, which is satisfactory.

VI. FINANCIAL EVALUATION

A. Rates and Charges

6.01 Charges currently levied by MOT and MOF consist for the main part of port dues, light dues, dockage, tug hire, transit shed and open storage charges, and warehousing. Cargo-handling charges are applied by concessionaires at rates approved by MOT. As the tariff system has evolved from various pressures, mostly political and budgetary, costs have had little or no influence. A summary of present port charges is set forth in Table 27. Tonnage dues (hereinafter called port dues) were increased by 100% on January 1, 1972. Otherwise, charges have not been raised for many years. In comparison, wholesale prices have risen about 300% since 1960 and 84% since 1965. Port charges therefore have been reduced substantially in real terms.

6.02 The level of charges is low and, in addition, the tariffs provide exemptions and highly preferential rates for coastal traffic, which pays

no port dues, only one-fourth of light dues and no wharfage, so that except for storage, most structures are provided free of charge. Thus, direct-delivery cargo pays nothing to the Government. In 1971 coastal cargo represented 37% of all cargo at Busan and 70% at Mukho.

6.03 Storage charges are inadequate either as revenue producers or as incentives for fast clearance of goods. At Busan, transit sheds are in effect used by Customs for warehousing, at rates far below those of private warehousing.

6.04 To introduce more definitive cost-related rates for port services by January 1, 1976, the costs of each principal tariff service will have to be developed, including all cargo-handling services. The costing procedures to be developed are to be agreed with the Bank and should be basically uniform for all ports. The advantages of uniformity are obvious. The basic classification of costs in conformity with the tariff cost centers will provide guidelines for realistic ledger accounts for the accounting system to be introduced. A modern commercial-type tariff containing definitions, rules of application and rates for all services at each scheduled port is required. The assistance of consultants will be provided for these tasks, in accordance with the plan of action.

B. Past Earnings

6.05 The status of port accounting procedures is currently inadequate. No single and complete set of accounts is prepared for the ports sector. The Study Group, over an extended period, was able to develop actual operating expenses for the year 1971 only. They should be considered as approximations. Revenues, however, are recorded in detail.

6.06 Table 28 shows operating revenues of the 17 first class ports over the period 1967-71; the increase is almost 150%. Total Korean cargo traffic rose by 178% during the same period. Revenues for 1972 are partly actual and partly estimated, and incorporate the 100% increase in tonnage dues on January 1, 1972.

6.07 Notional income accounts for 1971 and 1972 are in Table 29. They show that, for both Project ports combined, deficits of Won 341.4 million and 35.0 million resulted in 1971 and 1972, respectively. Busan was in profit (Won 110 million) in 1972 but only because maintenance was deferred pending substantial rehabilitation or replacements during the project period.

6.08 This situation is clearly unsatisfactory, principally because of the deficiencies in the tariffs referred to above. Remedial measures are described below.

C. Rate Policy

6.09 Charges assessed by the Government at Busan and Mukho are a small proportion of the value of the cargo. The ports' zones of influence are well defined, and the inter-port competition is small, resulting in an inelastic demand for port services. Thus, higher port charges are not

likely to divert port traffic; nor should it be expected that lower rates would induce higher traffic volumes. Thus, a plan to achieve financial viability would not reduce demand nor result in a distortion of economic traffic distribution. The Government intends to pursue a policy of financial viability for its ports with port charges reasonably related to fully distributed costs. In virtually all cases, since there appears to be little if any difference between fully distributed and marginal costs for Government services (port dues, dockage and wharfage), Government costs will be fixed costs. Revision of rates for Government services, in accordance with these concepts, will be accomplished on definitive bases by January 1, 1976. Accounting consultants' services will be needed. The above matters and the need to introduce remedial measures as of January 1, 1974 to improve the ports' finances on an interim basis prior to definitive action (para 6.16) were discussed and agreed during negotiations.

6.10 Government services are a relatively small part of the total cost of putting cargo through the scheduled ports, especially at Busan. A larger portion stems from cargo-handling services performed by commercial operators at rates approved by MOT. These charges should also be reasonably related to their costs, including maintenance and depreciation of, and a reasonable return on, the facilities now provided at no cost to the operators. It was agreed during negotiations that, after determination of cargo-handling costs by the consultants, and no later than January 1, 1976, a concession fee will be charged to all operators based on their exclusive and/or proportionate use of Port Authority facilities.

6.11 Progressive application of the foregoing rate policies to the first class Korean ports, other than the project and scheduled ports, is included in the agreed plan of action.

D. Financial Objectives

6.12 The project and scheduled ports should be financially viable, should no longer rely on Government subsidies and should recover their fully distributed costs from port users based on their use of port facilities. To this end, the internally-generated cash of each scheduled port should be sufficient to cover (i) fully distributed cash costs (excluding depreciation); (ii) debt service; and (iii) a reasonable portion of capital investments, including replacements. Internally-generated cash should also cover adequate cash working capital and reserves for contingencies. The returns which would provide adequate cash flow at both Busan and Mukho are discussed in paragraphs 6.18 and 6.24. The appropriate return on net fixed assets in use in 1978 for Busan and Mukho, and for KPA as a whole, is given in paragraph 6.27.

E. Future Earnings, Finances and Financing Plan

(1) Initial Authority Capitalization

6.13 The Government's opening equity in the Port Authority is considered to consist of (i) the value of all assets, including land vested in the Authority; these are presently estimated as shown on the balance sheets for

Busan and Mukho as of December 31, 1975; (ii) cash working capital, consisting of about 10% of estimated annual cash operating expenses (excluding depreciation), now estimated at Won 130 million for Busan and Won 20 million for Mukho; and (iii) the estimated value of stores to be transferred to the Port Authority for commencement of operations.

(2) Valuation of Assets

6.14 The Study Group has provided present values (1972) of land and other property used by each of Korea's 17 principal ports; consideration was given to values prepared by the Korea Appraisal Board, details of recent land sales in the vicinity, and the estimates of local officials. Engineering estimates were employed in respect to structures. Assets of great age were considered valueless and those planned to be replaced during 1972-76 or by the project were written down so as to be of no value when replacement occurs. Except as to land, the values presented have been accepted for the purpose of project appraisal and are the bases of the fixed asset and Government capital data shown in the balance sheets for 1973, after deducting depreciation for 1972. Land values at Busan and Mukho were estimated by the Study Group at Won 100,000 (US$250) and at Won 45,000 (US$112) per pyong 1/, respectively. These values have been reduced to a more realistic Won 30,000 and Won 12,000 per pyong, respectively.

6.15 Estimated income accounts, balance sheets and cash flow statements for Busan are in Tables 30, 31 and 32, and for Mukho in Tables 33, 34 and 35. Assumptions on which the forecasts have been prepared are in Annex 10.

(3) Future Earnings and Finances - Busan

6.16 Revenues will be much improved, beginning in 1974, when the following two-stage rate adjustments are adopted. A new charge, wharfage (for cargo passage over or through the terminal), will be introduced in 1974. No cargo or other handling operation is included in wharfage. Present tonnage and light dues, both of which are charged on the registered tonnage of ships, will be combined and redesignated as port dues. A new "service charge" against the ship should be introduced on January 1, 1976; this would recover the costs of tallying and of cargo security as well as of general expenses. The revenues per unit used in the financial projections are as follows:

Tariff Item	Unit	Effective January 1 (Won)		
		1974	1976	1978
Wharfage	Revenue Ton	50	100	112.5
Port Dues	Each GRT	5.0	20	22.5
Dockage	Each GRT/Hr	0.65	0.65	4.5
Service Charge	Revenue Ton	-	50	67.5

1/ One pyong = 3.6 m^2 (4 sq yd).

The 1976 adjustments relate to the completion of Pier 1, the coastal and international ferries and general channel dredging as of January 1, 1976. The dockage adjustment is deferred to 1978, when the Composite Pier, final dredging and the grain silo are scheduled for completion, even though Pier 7 should be completed as of January 1, 1977. The service charge is increased in 1978 when tonnage passing over the general cargo wharves will be reduced (Annex 5). The reduction of chargeable units will increase the costs and revenues per unit. Service charge revenues will decline substantially in 1977 and 1978. Forecasts are based on agreed tariffs for 1974 and indicative tariffs for 1976 and 1978; actual charges for 1976 and after will be cost-based with the assistance of consultants (para 6.04). Their implementation and their timing was agreed during negotiations.

6.17 The operating ratios, times interest earned, debt service coverages and rates of return for the years 1974 to 1981 are in Table 30 and are given below for 1974 and 1981.

Year	Operating Ratios	Times Interest Earned	Debt Service Coverages	Rates of Return
1974	67	1.6	2.9	4.0
1981	49	1.6	1.3	6.1

6.18 The capital-intensive nature of the port results in a high ratio of revenue to investment, since the port only provides and maintains the wharves and sheds while others actually perform the stevedoring and cargo-handling. The operating ratios shown in Table 30, although they superficially appear unduly favorable, are satisfactory for this reason.

6.19 The other ratios are good, except for the failure to earn all interest payments in 1975, 1976 and 1977; this is acceptable, since there are no debt repayments in these years and the debt service coverage is adequate.

6.20 The current, liquid, and debt/equity ratios are shown in the balance sheet, Table 31, and are satisfactory. The debt equity ratio in 1977, 56/44, represents the port's peak liability in respect of the proposed loan, and is acceptable. Cash flow data (Table 32) assume Government grants to carry out the investment program up to December 31, 1975, as is the present practice. A further grant on June 1, 1975 of Won 210 million is assumed to cover stores and to provide additional initial working capital. Surplus cash would be generated beginning in 1979 and would amount to about Won 700 million.

6.21 During 1974-81, internally-generated cash would be available to cover 16% of capital investments. This coverage would amount to 20% during the first six years of the Authority's existence, 1976-81. This is satisfactory. The Bank and Government loans cover 59% and 16% respectively. Repayment of the Government loans has been spread over eight years starting in 1979. Thus in effect the Authority's contribution over 1976-81 is 43%. The financing of the investments would be as shown in Table 32 and summarized below:

	1974-81		
	Sub	Amount	%
		(Won millions)	
Requirement			
Capital Investments		49,678	100
Availability			
Internally-Generated		28,865	
Less: Debt Service	20,262/1		
Working Capital	200		
Stores	100		
Cash Retained	402	20,964	
Available Internally-Generated		7,901	16
Government Budget		4,642	9
IBRD Loan		29,035	59
Government Loans		8,100	16
TOTAL		49,678	100

/1 Including partial repayment of Government loans (4,050).

F. Future Earnings and Finances - Mukho

6.22 In order to attain financial viability at Mukho, rates should be so adjusted as to produce revenues per unit, as indicated below:

Tariff Item	Unit	Effective January 1 (Won)		
		1974	1976	1977
Wharfage	Revenue Ton	1.5	1.5	20
Port Dues	GRT	30	60	60
Dockage	GRT/Hr	1.5	1.5	3.0
Service Charge	Revenue Ton	-	6.25	6.25

6.23 In the case of wharfage and dockage, adjustment of the interim tariff is deferred to 1977, because Coal Pier B and the rehabilitation of the cement and central wharf will not be operational until January 1, 1977. The breakwater improvements, however, will be completed early in 1976, thus affecting costs related to port dues in that year. The service charge is generally related to low-volume general-cargo traffic which is largely coastal, and revenues are related to fixed labor force costs rather than cargo volumes. Implementation and timing of these proposed tariff changes was agreed during negotiations. Forecasts are based on agreed tariffs for 1974 as listed above and indicative tariffs for 1976/77; the actual values for 1976/77 will be cost-based with assistance from consultants (para 6.04).

6.24 The operating ratios, times interest earned, debt service coverages, and rates of return for 1974-81 are in Table 33 and are given below for 1974 and 1981.

Year	Operating Ratios	Times Interest Earned	Debt Service Coverages	Rates of Return
1974	65	4.0	3.6	4.5
1981	45	3.0	3.3	8.1

The operating ratios, like those at Busan, superficially appear unduly favorable. The same comments apply (para 6.18). Earnings under the adjusted rates would be satisfactory.

6.25 The balance sheet data (Table 34) reflect a good financial position during the entire 1974-81 period. In 1976 there will be a cash shortage amounting to Won 166.6 million; thereafter the current and liquid ratios are satisfactory. Debt equity ratio would range from 16/84 in 1974, when debt is lowest, to a peak 37/63 in 1976, 1977 and 1978, falling to 31/69 in 1981, which is acceptable.

6.26 During the 1974-81 period, internally-generated funds would provide 38% of the capital investment requirements and would rise to 61% in the 1976-81 period. The financing of the investments would be as indicated in Table 35 and is summarized below.

	1974-81		
	Sub	Amount (Won millions)	%
Requirement			
Capital Investments		5,930	100
Availability			
Internally-Generated		4,434	
Less: Debt Service	1,407		
Stores	20		
Working Capital	42		
Cash Retained	684	2,153	
Available Internally-Generated		2,281	38
IBRD Loan		2,765	47
Government Budget		884	15
TOTAL		5,930	100

G. Rate of Return

6.27 Pending assessment of actual costs and determination of appropriate charges for the four scheduled ports and the other first class ports to be included in KPA in addition to Busan and Mukho, an overall rate of return for KPA cannot be determined. For Busan and Mukho a return of 6% on net fixed assets in 1978 will be satisfactory. During negotiations it was agreed with the Government that the rate of return on the net fixed assets at Busan and

Mukho will be not less than 6% in 1978 and thereafter, and that the return in 1978 and thereafter for KPA as a whole will be agreed between KPA, the Government and the Bank following completion of the financial consultants report.

H. Auditing and Insurance

6.28 The accounts and financial statements of the Port Authority when established will be annually audited by independent qualified auditors satisfactory to the Bank.

6.29 The Port Authority will provide adequate insurance through commercial insurers or otherwise in accordance with sound business practices and in a manner satisfactory to the Bank, as discussed and agreed during negotiations.

VII. AGREEMENTS REACHED AND RECOMMENDATION

7.01 The following major items were discussed and agreed with the Government during negotiations:

(a) the execution of the project by MOT until January 1, 1974 by which date the Busan-Mukho Project Unit (BMPU) will be established for that purpose. KPA will be established by June 1, 1975 and will then take over the project from BMPU (para 3.28);

(b) the form of KPA, its financial and operating status and duties and the organization and duties of the Port Units; dates for implementing and completing action to establish KPA and individual Port Units, and extending their jurisdiction to various ports in accordance with the agreed plan of action in the Loan Agreement (paras 3.20-3.27);

(c) the Government's annual budget for local currency cost of the project to include the Military Wharf and project item contingencies (para 4.03);

(d) appointment of consultants for the second development plan and to assist KPA in devising and introducing new operating procedures and an accounting system (paras 4.07-4.08);

(e) limitation of expenditure on ports other than the project ports to that recommended by the Study Group except for the agreed investment financed by ADB at Inchon (para 4.12); and

(f) financial viability of KPA; introduction of interim remedial measures by January 1, 1974, and further permanent tariff increases in 1976 so that KPA will earn a financial rate of return of not less than 6% on the next fixed assets of Busan and Mukho by 1978, and an overall financial rate of return for all KPA ports in 1978 to be agreed between it, the Government and the Bank on completion of the financial consultants report (paras 6.16, 6.22 and 6.27).

7.02 The project forms a suitable basis for a Bank Loan of US$80 million to the Government of Korea for a term of 25 years, including a five-year grace period.

May 24, 1973

KOREA

APPRAISAL OF A FIRST PORT PROJECT

Transport Infrastructure, Equipment and Operations

The main physical and operational features of the Korea transport system are given by modes of transport in the following table:

	1962	1965	1967	1969	1970
I. ROADS					
1. Road Network					
National Highways (km)					
Paved	865	1,042	1,442	1,957	2,461
Gravel	4,914	4,849	6,651	5,407	6,158
Unrepaired	31	8	93	206	40
Subtotal	5,810	5,899	8,186	8,570	8,659
Local Roads (km)					
Paved	577	585	649	1,013	1,403
Gravel	18,219	17,874	21,860	23,954	26,803
Unrepaired	3,449	3,787	4,105	3,631	3,380
Subtotal	22,245	22,246	26,614	28,598	31,586
Total (km)					
Paved	1,442	1,627	2,091	2,970	3,851
Gravel	23,133	22,723	28,511	30,361	32,961
Unrepaired	3,480	3,795	4,138	3,837	3,420
Grand Total	28,055	28,145	34,800	37,168	40,245
Road km per km^2 of area	0.29	0.29	0.35	0.38	0.41

Source: Ministry of Construction.

		1962	1965	1967	1969	1970
2. Motor Vehicle Fleet						
Passenger Cars		11,074	13,001	23,235	50,299	60,677
	Buses	4,406	9,313	11,499	14,327	15,831
Trucks		13,093	16,015	22,955	40,134	48,901
Others /1		2,241	3,179	3,011	3,999	3,962
	Total	30,814	41,508	60,700	108,759	129,371
Persons/vehicle		1,038	771	527	294	247
II. VESSELS (Gross Tonnage)						
Oceangoing:	Passenger	-	915	915	915	915
	Cargo	-	156,844	258,337	463,440	491,143
	Oil Tanker	-	5,242	152,721	275,455	248,887
	Subtotal	-	163,001	411,973	739,810	740,945
Coastal:	Passenger	-	14,886	15,168	17,227	17,742
	Cargo	-	42,498	66,859	85,358	96,073
	Oil Tanker	-	8,616	34,751	63,148	65,173
	Subtotal	-	66,000	116,778	165,733	178,988
Others		-	156,485	209,924	290,638	298,948
	Total	373,099	385,486	738,675	1,196,180	1,218,881

/1 Includes motorcycles.

Source: Ministry of Transport

	1967	1968	1969	1970	1971
III. RAILWAYS					
1. System					
Route-km - Standard gauge (km)	2,980	3,036	3,073	3,073	3,085
- Narrow gauge (km)	125	125	125	125	125
- Total (km)	3,105	3,161	3,198	3,198	3,210
2. Traffic					
Pass-km (millions)	9,577	10,590	11,077	9,819	8,750
Net ton-km (millions)	6,178	6,865	7,328	7,709	7,841
Traffic units (millions)	15,755	17,455	18,405	17,528	16,591
3. Operation					
Train-km by mode of traction					
- Steam (000's)	2,834	490	655	1,334	706
- Diesel (000's)	23,455	28,183	31,258	33,271	35,423
- Railcar-Powered (000's)	9,270	8,803	7,921	5,770	5,833
- Total (000's)	35,559	37,476	39,834	40,375	41,962
Train-km by service					
- Passenger (000's)	20,041	21,740	23,426	23,183	24,084
- Freight (000's)	15,518	15,736	16,408	17,192	17,878
- Total (000's)	35,559	37,476	39,834	40,375	41,962
Number of engines in fleet					
- Steam	205	115	115	109	80
- Diesel	238	252	282	277	337
- Railcar-Powered	163	161	161	156	156
- Total	606	528	558	542	573

Source: Ministry of Transport and Korean National Railways.

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KOREA

APPRAISAL OF A FIRST PORT PROJECT

Transport Coordination

1. To provide a basis for improving transport planning and coordination, a study was financed under Credit S-4 KO and carried out by consultants BCEOM/NEDECO (France/Netherlands). Based on this study, Credit Agreement 183-KO provided that measures to achieve adequate coordination in transport would be agreed with the Bank Group. The consultants' final report (May 1970) suggested, as a long-term solution, placing responsibility for all transport modes under one Ministry. This was not acceptable to the Government. Toward the end of 1969 and the beginning of 1970, the Government set up a three-tiered organization responsible for transport planning and coordination: the Transport Coordination Ministers Conference (TCMC), the Transport Coordination Working Group (TCWG) and the Transport Planning Office (TPO) within the Ministry of Transport (MOT). The functions of these agencies are described below:

(a) The Transport Coordination Ministers Conference (TCMC) was established in January 1970 to coordinate and discuss transport plans and policies at the ministerial level. TCMC consists of the Ministers of EPB, MOC, MOHA 1/, MOF 2/, National Defense, MOCI 3/, MOT and the Minister Without Portfolio, and is headed by the Deputy Prime Minister and Minister of EPB.

(b) The Transport Coordination Working Group (TCWG) was established in September 1970 as an instrument of TCMC and is intended to provide liaison and information from the Ministries concerned at the working level. This group also deals with monthly traffic allocation between rail and coastal shipping.

(c) The Transport Planning Office (TPO) in MOT was organized in December 1969 for appropriate coordination of the transport sector and is designated as a permanent body to serve as the secretariat of TCMC. It was intended that TPO should be responsible for undertaking economic analysis and rendering professional advice to TCMC on investment planning and important transport policy matters, including licensing, pricing and taxation.

1/ Ministry of Home Affairs

2/ Ministry of Finance

3/ Ministry of Commerce and Industry

2. However, substantive issues relating to investment planning and policy measures have not received adequate attention, despite their importance in view of the expected large investments in the transport sector during the 1972-76 Plan period (about 24% of total capital investment).

3. The matter of transport coordination was discussed during negotiations for the Fourth Railway Loan signed in November 1972, and an action program was agreed upon. To make the work of TCMC, TCWG and TPO more effective, even within the present organizational structure, the functions and work program of TPO, including the collection and preparation of sound data relating to costs and operation of all modes of transport, will be reviewed and TPO will furnish periodical reports thereon to the Bank. Also, there is to be an early strengthening of the economic expertise in TPO by direct appointment and/or training. (This is also partly covered by the financing of training of TPO staff under the First Highway Loan, Loan 769-KO, 1971.) Further, a Government directive will be issued to all relevant Government agencies, including MOC, to ensure that all major investment proposals related to transport are passed to TPO for economic appraisal and coordination purposes.

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KOREA

APPRAISAL OF A FIRST PORT PROJECT

Present Port Administration

Functions of Government Departments Involved

A. Responsibilities of the Ministry of Transport

1. The existing arrangements for port management undertaken by the Ministry of Transport are included in the following staff-level offices, bureaus and sections, supported by port-level executive branches. The staff-level units concerned are:

- Planning and Coordination Office
- General Affairs Division
- Bureau of Marine Transportation, Hydrographic Office.

The functions and duties of these departments are outlined below.

2. The Planning and Coordination Office, which is headed by the most senior civil servant within the Ministry, provides a secretariat service to the Minister and Vice-Minister and develops, controls, and coordinates overall transportation policy as approved by the Minister. These activities are organized through:

(a) Development Division

(i) Development Section

(ii) Economic Cooperation Section

(b) Transport Management Division

(i) Transportation Section

(ii) Railway Management Section

(c) Statistics Division

(d) Planning and Budget Division

(e) Administration Management

(f) Internal Audit and Inspection

(g) Legal Affairs.

3. The General Affairs Division deals with personnel management within an organizational framework devised by the Administration and Management Division of the Planning and Coordination Office. It is thus concerned with recruitment, training, pensions and associated personnel administrative matters. Additionally, this division is responsible for general services associated with a headquarters office, such as building administration, office supplies, ceremonial duties, administrative vehicles, and documentation control and flow. It is also responsible for financial control and liaison over cash flow with the Ministry of Finance within the framework of the budgets controlled by the Planning and Coordination Office.

4. The Bureau of Marine Transportation is involved in a wide range of marine transportation matters. Its responsibilities are carried out by the following staff-level divisions and sections under the control of the Director with District Marine Bureau and port representation as needs demand:

(a) Coastal Division

Acts as secretariat to the Director.

(b) Port Division

Responsible for port matters, and through its Port Affairs, Planning and Facilities Sections, is concerned with:

- Improvement of port management
- Control of port traffic
- Licensing of commercial business in port area
- Port traffic statistics
- Port development plans
- Supervision of pilots' activities
- Promotion, advertisement and training of staff
- Port facilities and equipment operation
- Port security
- Management of port assets.

(c) Vessel Division

Through the Vessel and Safety Sections:

- Vessel inspection and survey
- Ship registration
- Improvement of vessel standards
- Liaison with MOCI over ship-building
- Sea accidents
- Licensing of salvage operators
- Pollution control of sea water
- Ship-building and repair standards and facilities.

(d) Crew Division

(e) Communications Division

This division was established two years ago following a marine disaster and is in course of development. The aim is to provide an adequate communication system to minimize the effects of disasters at sea and to provide a flow of meteorological and hydrographic information to vessel operators. Ultimately, it is hoped to provide television dock surveillance and radio communications to ship and port operators and associated agencies.

5. Hydrographic Office. Through headquarters at Seoul and the Busan Branch Office and additional navigational aids personnel controlled by other District Marine Bureaus, this office carries out the following functions:

- Conducts hydrographic surveys and oceanographic observations in Korean waters and adjacent seas.
- Collects hydrographic and oceanographic information from all available sources to promote safe navigation of vessels.
- Provides for the national and international agencies concerned, with accurate nautical charts, sailing directions, notices to mariners and related navigational publications.
- Contributes hydrographic and oceanographic information for the exploitation of land cultivation, tidal-land reclamation and marine resources.

- Authorizes and supervises the hydrographic survey and its products carried out by other agencies.

- Authorizes and supervises the reprinting or copy of navigational publications issued by other agencies.

- Maintains and establishes the navigational aids along the coasts of Korea for safe navigation.

- Acts as the national representative to the International Hydrographic Organization and International Association of Lighthouse Authorities (IALA) to encourage international exchange of technical information for the development of hydrography and oceanography.

6. District Marine Bureaus. As seen on the enclosed organization chart, the District Marine Bureaus report directly to the Vice-Minister. They also, however, work through the Bureau of Marine Transportation. The functions of the District Bureaus reflect, to a large degree, those of the divisions of the Bureau of Marine Transportation. The organization chart showing the divisions and sections of the Busan Marine Bureau, included as an example, points up this similarity in structure and responsibility assignment. It should be pointed out, however, that only in the ports of Busan and Inchon are responsibilities of the District Bureaus so extensive and so formally structured. Most of the other District Bureaus have only Administration, Marine Affairs, and in some cases Maritime Safety and Navigational Aids Divisions. No District Bureau, with the exception of Busan and Inchon, has a Vessel Division or Crew and Inspection Divisions or Sections. The ports of Busan, Inchon, and Mogpo do, however, have branch offices of the Office of Marine Accident Inquiry, which is an agency within MOT but separate from the Bureau of Marine Transportation.

B. Responsibilities of the Ministry of Construction

7. Bureaus at the staff level in the Ministry of Construction are:

- Planning and Management Office

- General Affairs Section

- Foreign Construction

- Resident Office

- National Physical Planning

- Housing and Urban Planning

- Water Resources

- Public Roads

- Harbor Development

- Management.

In addition, the following specialist agencies and offices report directly to the Vice-Minister of the Ministry of Construction.

- National Construction Research Center

- Construction Officials Training Center

- Heavy Equipment Plant

- Major Expressway Construction Office

- Kyongju Development Construction Office.

Of the above, the Planning and Management Office, General Affairs Section, Management Bureau, and the Bureau of Harbor Development are presently involved in port organization and management functions to some degree. Unlike the first three, however, the Bureau of Harbor Development is largely concerned with port matters.

8. The Bureau of Harbor Development, Ministry of Construction, carries out its work through a Harbor Planning Division, a Coastal Management Division, a Port Construction Division and a Dredging Division. The Ministry maintains a Port Construction Office in most ports administered by the Port Section of the Regional Construction Bureau from which a number of ports are administered. Thus, port planning, design and construction are carried out within the individual port by assigned staff using local contractors as appropriate. Major port maintenance and repair are performed by employees of the local Port Construction Office; minor maintenance and repair are the obligation of Ministry of Transportation. Dredging is done by contract with Korea Dredging Corporation under the jurisdiction of MOC.

(a) Harbor Planning Division is responsible for

- Staff function - assist Harbor Bureau Director

- Developing the overall development plans for 40 designated harbors and canals

- Annual project selection and budgeting

- Foreign loan procurement and technical assistance in ports construction

- Port statistics

- Analysis and adjustment of port investment efficiency (cost benefit work).

(b) Harbor Construction Division

- Construction of ports and canals; improvement planning and surveying; and design research
- Port planning according to industrial development plans in port area
- Directing and supervising port construction
- Maintenance of port and canal facilities (there are currently no canals in Korea although some, notably the Seoul-Inchon Canal, are being considered).

(c) Dredging Division

- Dredging, planning, and surveying of ports and canals
- Planning and surveying of port navigational channels and mooring facilities
- Supply and demand and repair plan of dredging vessels
- Technical training and supervision of Korea Dredging Corporation.

(d) Coastal Management Division

(i) Port Administration Section

- Establishment and research of port law, excluding laws relating to fishing ports; submits MOT coordinated law proposals to the Office of Legislation in the Prime Minister's Office, who in turn submits them to Congress
- Approval of private development in all 40 Korean ports
- Organizing port committees including the advisory committee to the Minister of Construction and nine regional committees. The Central Port Committee has never met and only exchanges documents. The regional committees report to the Central Port Committee.

(ii) Public Water Area Management Section

- License reclamation proposals and utilization of reclaimed areas
- License of private facilities using sea area (the level of rental is set by Seoul Headquarters, not by Regional Construction Offices).

(iii) Seashore Conservation Section - all Korea

- Statistics collection
- Establishment of oceanographic observation survey and planning
- Survey of coastline for:

  Tourism
  Construction materials
  Fishing
  Development/construction recommendation.

9. The Regional Construction Bureaus exercise their port responsibilities through their Harbor Construction Sections. As shown on the accompanying organization chart, the Harbor Construction Sections are connected with the Bureau of Harbor Development as well as to their respective Regional Bureaus. General administrative and executive control is provided by the Regional Bureau while technical responsibilities for ongoing and planned construction and maintenance projects are directed by the Harbor Development Bureau. The Harbor Construction Sections of the Regional Bureaus are responsible for the administration of the planning and construction of port facilities, and they act chiefly as a consolidation point for information and for management.

10. The actual control and inspection of harbor construction projects take place at the individual Port Construction Office level. The specific responsibilities of these offices are summarized as follows:

(a) Construction Sub-section:

- Design of minor facilities based on Seoul Headquarters criteria
- Cost estimates
- Supervision of contracts

  Dredging
  Public water area reclamation
  General construction and maintenance

- Control of MOC vessels engaged in sounding and survey work
- Supervision of activities at various ports.

(b) General Affairs Sub-section:

- Maintains accounts
- Purchases construction materials and office supplies
- Controls materials warehouse
- Issues public water area license (revenue collected and controlled by Regional Bureau)
- Selects contractors for minor contracts (contracts in excess of Won 1,000,000 are usually handled by Seoul Headquarters).

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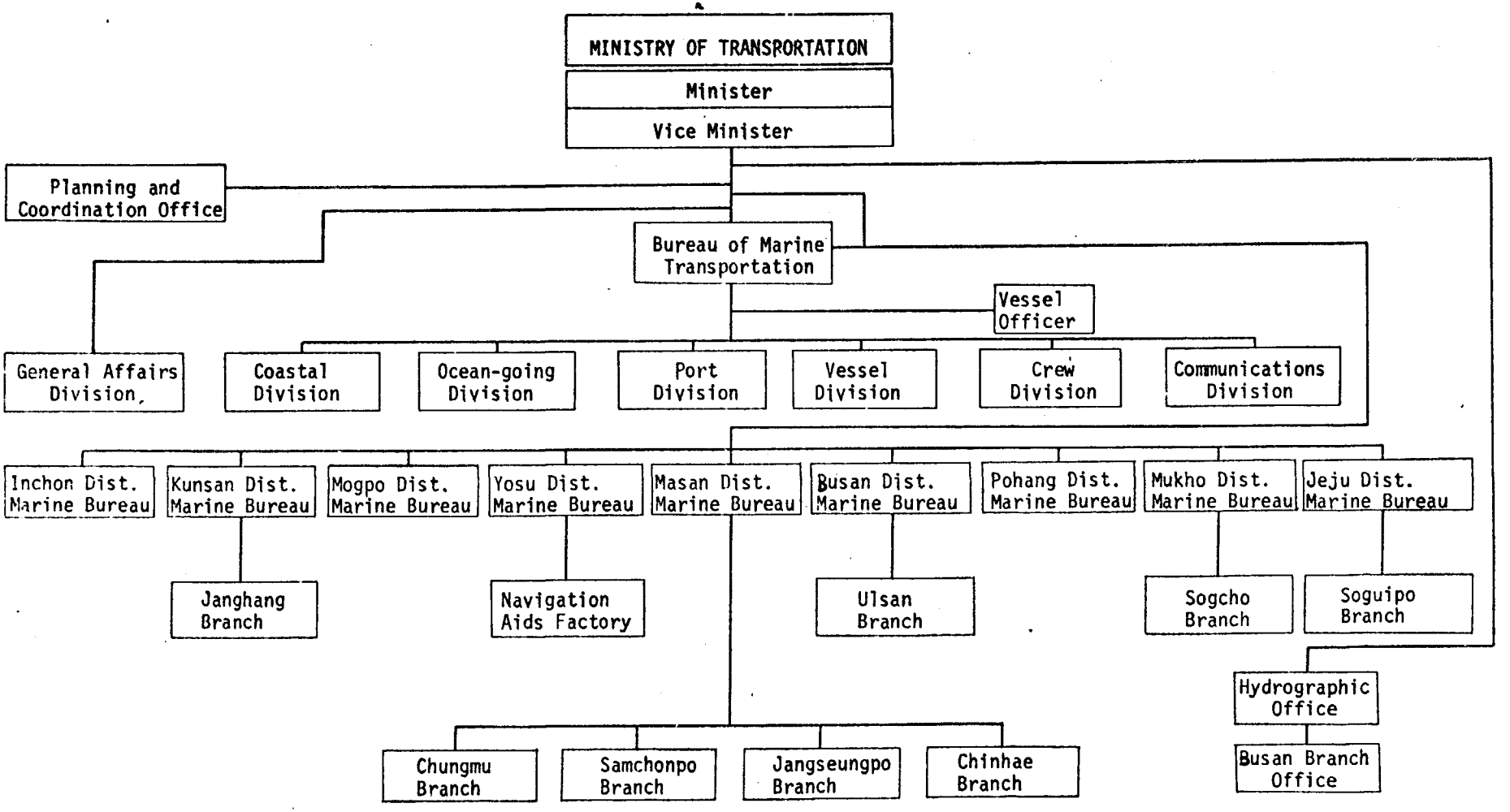
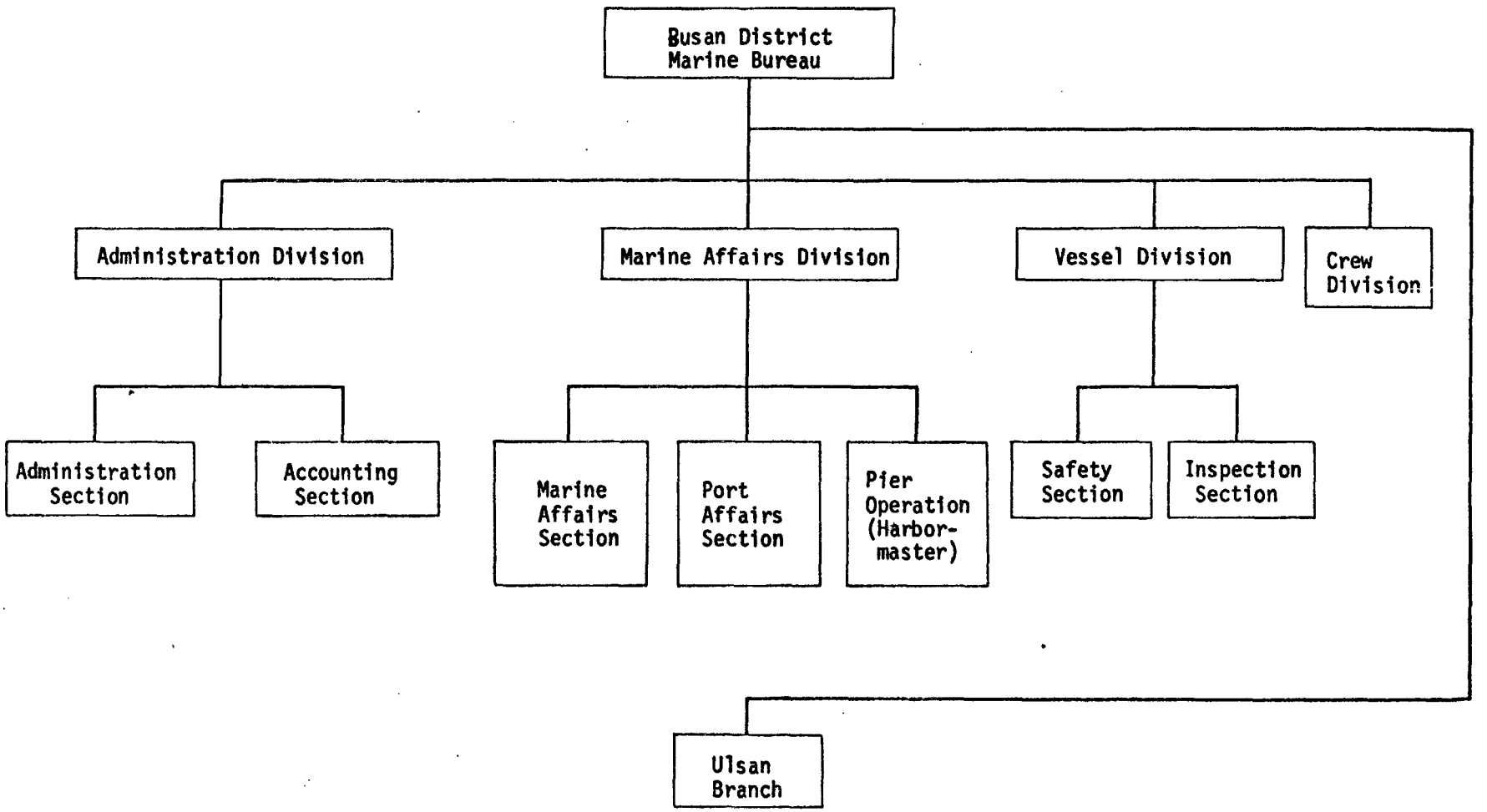
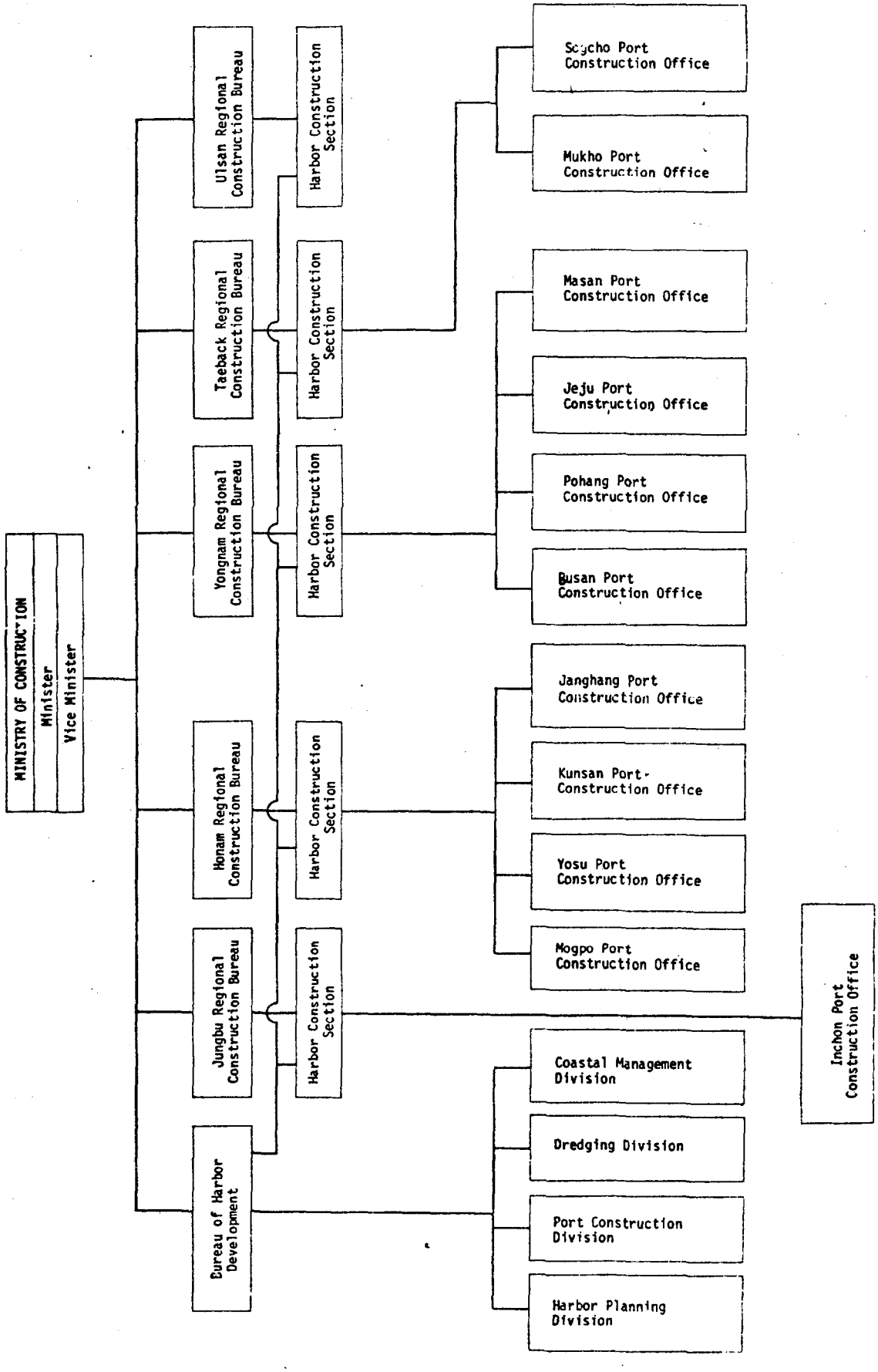

MINISTRY OF TRANSPORTATION
Minister
Vice Minister
Planning and Coordination Office
Bureau of Marine Transportation
Vessel Officer
General Affairs Division
Coastal Division
Ocean-going Division
Port Division
Vessel Division
Crew Division
Communications Division
Inchon Dist. Marine Bureau
Kunsan Dist. Marine Bureau
Mogpo Dist. Marine Bureau
Yosu Dist. Marine Bureau
Masan Dist. Marine Bureau
Busan Dist. Marine Bureau
Pohang Dist. Marine Bureau
Mukho Dist. Marine Bureau
Jeju Dist. Marine Bureau
Janghang Branch
Navigation Aids Factory
Ulsan Branch
Sogcho Branch
Soguipo Branch
Hydrographic Office
Chungmu Branch
Samchonpo Branch
Jangseungpo Branch
Chinhae Branch
Busan Branch Office


Busan District Marine Bureau
Administration Division
Marine Affairs Division
Vessel Division
Crew Division
Administration Section
Accounting Section
Marine Affairs Section
Port Affairs Section
Pier Operation (Harbor-master)
Safety Section
Inspection Section
Ulsan Branch


MINISTRY OF CONSTRUCTION
Minister
Vice Minister
Ulsan Regional Construction Bureau
Taeback Regional Construction Bureau
Yongnam Regional Construction Bureau
Honam Regional Construction Bureau
Jungbu Regional Construction Bureau
Bureau of Harbor Development
Harbor Construction Section
Harbor Construction Section
Harbor Construction Section
Harbor Construction Section
Harbor Construction Section
Seocho Port Construction Office
Mukho Port Construction Office
Masan Port Construction Office
Jeju Port Construction Office
Pohang Port Construction Office
Busan Port Construction Office
Janghang Port Construction Office
Kunsan Port Construction Office
Yosu Port Construction Office
Mogpo Port Construction Office
Inchon Port Construction Office
Coastal Management Division
Dredging Division
Port Construction Division
Harbor Planning Division

KOREA

APPRAISAL OF A FIRST PORT PROJECT

Existing Port Operations at Busan and Present Port Capacity

A. Existing Operations

1. There is little control of operations by the Busan District Marine Bureau, the local unit of the Bureau of Marine Transport, Ministry of Transport (MOT), other than provision of pilotage and tug services. Shipping appears to elect to tie up at one of the anchorages or berths as may be requested by the shipping agent although MOT approval is required. This results in inefficient berth utilization and there are numerous cases of ships discharging at anchorage and loading at a berth. About 80% of export cargo is handled at the berths against about 45% of imports.

2. Overall, about 38% of general cargo was handled by lighters in 1971/72; lighters are privately owned and rented directly by the shipping companies. Cargo handled at the commercial berths in 1971/72 was about 1.2 million tons. Total break bulk cargo in 1971/72 was about 1.9 million tons. However, because of the low throughput at the berths (about 550 ton/m/year - giving a maximum throughput of about 1.4 million tons through the berths - approximately 30% of total break bulk cargo would have had to be lightered in any case. Calculation of port throughput capacity is given later in this Annex.

3. All cargo is presently handled by 24 stevedore companies licensed by MOT plus a further eight licensed for one commodity only. These companies can be:

(a) allocated an area of the port and can handle all cargo from ship to shed/storage area at that place or make direct delivery from ship to consignee's vehicle;

(b) employed by a consignee to handle his goods ex-storage; or

(c) employed by a shipping agent to discharge to lighter and bring ashore; in this case they would hand over the goods to the firm in charge of the area where they are landed.

The companies in fact undertake little more than tallying and management and have no labor of their own. Labor is provided by the labor union executive, on demand, in gangs of 16 men per hatch on board ship and 20 ashore. The total labor force available in the port is about 7,000 men. Of the payment received by the company on the basis of the MOT-agreed tariff and tonnage handled, 60% is paid to the union, which retains 2% and pays the balance to the gang involved.

4. Very little mechanical equipment is used except to handle some grain and cement. General cargo is largely handled by men with "A" frame packs on their backs; even coal traffic and minerals unloaded from rail cars are for the most part handled in this way. The gangways provided for goods being handled from lighter to quay are crude and difficult to negotiate. Pallets are not used in the sheds. No pressure is applied to use equipment available for hire (Table 3) and it is normally only employed when weight precludes the use of manual labor. All handling of goods to and from ship is by ship's gear, again except when use of the floating crane is necessary due to weight limitation of the gear.

5. Labor is disciplined and hard-working, and productivity on ordinary break bulk cargo is about 8 tons/gang/hr, which is fairly good considering that little mechanical equipment is used. Generally only one 10-hour shift is worked each day as there is no lighting in transit sheds and inadequate lighting on the piers. A large number of coastal vessels using Busan have only one or two hatches, and the average tons discharged per ship/day is about 250 tons. Calculation of berth occupancy on this basis is given at the end of this Annex.

6. Storage in the sheds is controlled by a separate non-profit organization - the Wharf Operators Association - which is also responsible for security. It employs some 200 men and obtains its income from a separate levy based on invoice value of cargo stored. Six days' free storage is allowed in sheds, but the charges raised thereafter do not increase with time of storage, and an average cargo unit stays in the sheds 15 days. This is a major limiting factor on capacity of the port, as shown later. Storage in the sheds is controlled and dictated by customs officers. Furthermore, no movement of any discharged cargo even within the port, from place to place, or from the port to bonded warehouse, can take place without written approval of customs; in effect the disposition of all unloaded cargo is determined by the Customs Department. MOT has no control over this aspect of operations.

7. Documentation is cumbersome and excessive, apart from the normal requirements for health immigration and quarantine on the vessel's arrival. MOT requires five forms and Customs Department uses 22 different controls on ship and cargo movement in the port. In addition, the ship's agent has to make all necessary contacts for stevedore services, lighters as required, and storage of cargo.

8. About 25% of total tonnage arriving at and leaving the port is handled by rail and 75% by road. Access within the port is made difficult by the occupation of Pier 3 and part of the Central Wharf by the military. Apart from this aspect, which will be corrected under the proposed project, road and rail access can be regarded as satisfactory. There are, however, two matters for consideration: (i) traffic congestion exists in the town, and it is thought that a new access road to bypass city traffic may be required. This is under investigation; and (ii) a logical system needs to be developed for calling forward, and movement on the piers, of bulk rail and road traffic.

9. At the present time, considerable cargo is delivered directly, due in part to the increased costs incurred when placed in storage; this is largely due to the use of different stevedore companies for handling cargo ex-lighter, in the shed, and for delivery from shed. Direct delivery does, of course, tend to increase port throughput and is to be encouraged; however, it must be carefully planned and controlled; ships are presently being kept alongside berths unnecessarily while awaiting either arrival of cargo for export or lorries into which direct import deliveries can be placed. (See also 8(ii) above.)

10. Essentially, the poor operating results are due to an almost complete lack of any central control or direction, and to cargo being handled by too many separate organizations. This is particularly bad in view of the physical restriction (narrow aprons, no lighting, etc.) which currently exist, and results in the low overall throughput of 550 tons/meter previously mentioned.

11. Petroleum products traffic at Busan consists for the most part of coastal movements. It is handled in the outer harbor at off-loading facilities provided by the oil companies, and presents no problems.

B. Present Port Capacity

12. The estimated maximum capacity of the port at present, calculated on the basis of 0.6 tons/m^2 of storage capacity and 15 days' average storage (24 turnovers per annum), plus 25% of the total direct delivery, is as follows:

Pier	Available Commercial Berth m	Storage Area (m^2) (Transit Sheds & Open Storage)	Throughput Capacity Tons/Year	25% for Direct Delivery	Total Throughput Capacity Tons	Tons Per Lin. Meter (Rounded)	Remarks
1 South	-	-	-	-	-	-	Used exclusively for fishing market.
1 North	400	10,000	145,000	35,000	180,000	450	-
2 (North	380	22,500	325,000	80,000	405,000	510	-
(South	410						
4 (North	235	25,000	360,000	90,000	450,000	580	Cement wharf 165 m and shallow area at base 203 m deducted from North Side.
(South	540						
Central Wharf	480	20,000	290,000	75,000	365,000	750	Excluding 160 m used by military
	2,445				1,400,000	550	

A calculation of the berth occupancy to be expected in the port corresponding to the 1.2 million tonnage handled over the wharves as follows:

Total available berth space	=	2,445 m
Average length of berth	=	120 m
Number of available berths	=	20 /1
Berth days available	=	20 x 365
	=	7,300
Tonnage handled in 1971/72 at berths	=	1.2 million tons
Rate of discharge/ship day	=	250 tons
Ship days required	=	4,800 days
+ 33-1/3% of ships waiting cargo 50% of time		800 "
+ 33-1/3% of ships waiting cargo 70% of time		1,120 "
		6,700 days

/1 The number of berths calculated on 120 m berth; i.e., an average ship size of 5,500 dwt.

13. This gives a theoretical berth occupancy of over 90%, but statistics available are insufficient to place much reliance on the actual percentage. For example, ships waiting for cargo collection may have been waiting at anchorage. However, this calculation and that preceding do show that the 1.4 million overall capacity is a reasonable estimate in present conditions. On 1.4 million tonnage over the wharves, the occupancy would be a possible 75% (for 20 berths) if all the time spent waiting for cargo was spent at anchorage in the harbor. There is in fact no waiting time in the port at present (in the sense of a shipping queue) due to the ability to handle cargo at anchorage by lighters.

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APPRAISAL OF A FIRST PORT PROJECT

Proposed Operational Procedures; Duties and Time Allocation of Specialist Consultants, and Training

1. The Port Units should directly control and be responsible for (i) allocation of berths and shipping movements; (ii) allocation of private operators to berths or areas of the port, supervision of their operations and agreement on their charges; (iii) all cargo movement within the customs area; (iv) storage of cargo in transit sheds; (v) tallying of cargo and statistical data collection; (vi) safety, security and insurance; (vii) maintenance of port assets; (viii) use of tugs; (ix) pilotage; (x) leasing of port property; (xi) preparation of operational budget and investment proposals; and (xii) documentation. The need to introduce new accounting methods, costing procedures, and adequate tariffs to ensure the viability of the ports is discussed in Chapter VI.

2. It is not proposed to change the present methods whereby cargo handling is carried out by private operators, but they should be reorganized so that only one company is responsible for all movements on a single berth or a group of berths and more efficient handling methods introduced. The specialized berths to be provided under the project should be handled by concessionaires. The present method of providing labor is satisfacotry (being in effect a labor pool) but operators must provide properly trained foremen to control the gangs.

3. Within the general framework outlined above, the operational and management consultants to be provided under the project should prepare detailed port regulations, operational procedures, staff requirements and documentation procedures, to implement the new organization and recommendations for dealing with the expected surplus labor. The financial consultants should determine costs of operations and prepare the new accounting system to be installed and the new tariff schedule. It is also foreseen that a number of specialists would be available over the period from about September 1975 to about the end of 1978 to familiarize the Port Unit directors with the new procedures and assist them in their implementation.

4. Allowance has been made for 220 man-months of consultants' time to be available. Between mid-1974 and mid-1975 it is foreseen some 60 man-months would be spent on the preparation of the new procedures, including the Project Manager, and 48 man-months for the financial experts to determine costs, set up a new accounting system and propose the new tariff schedule.

5. The balance of 112 man-months will be used to assist in implementing the new procedures between September 1975 and January 1977 for cargo handling, financial and management documentation specialists; after January 1977 for bulk handling specialists; and after January 1978 for the container operation specialists. The Project Manager for the second phase should be the Management/Documentation specialist.

Port	Type of Specialist	Number of Specialists	Period Available	Man-months
Busan	Management/Documentation	1)		
	Container Operations	1)	12	36
	Cargo-handling	1)		
	Financial	1	6	6
	Bulk-handling	1	6	6
Mukho	Bulk-handling	1	6	6
	Management/Documentation	1	6	6
	Financial	1	1	1
KPA HQ	Management/Documentation	1	12	12
	Project Manager	1	12	12
Other Scheduled Ports	Management/Documentation	2	12	24
	Financial	1	3	3
		10	-	112

6. It is proposed that these specialists should work as expert advisers to the Port Unit/KPA director as the case may be and advise him on the day-to-day problems arising from application of the new procedures and operating methods. The success or otherwise of this technical assistance will depend on the directors concerned taking appropriate action on the advice received and the Director General of KPA will have to ensure that this is done.

7. Specialized training of labor in the handling of general cargo is not necessary at this time, since improved management practices and procedures are the major requirement for improved productivity. Similarly, overseas fellowships for individuals are not necessary at least until the new procedures and methods have been brought into use and experience with them has been gained. It will however, be important that appropriate staff members of KPA and/or the Port Units should work with the specialist consultants, to be trained by them during the implementation stage of the procedures.

Port Capacity under Revised Organization

8. The capacity of the container and bulk handling piers are dealt with in Annex 6. Insofar as the general cargo berths are concerned it is calculated that the overall capacity of the port under the new systems (and allowing for the minor improvement to general cargo berths proposed in the project) will be:

Pier No.	Berth Length	Total Throughput	Tons/lin m	Remarks
1 South	-	-	-	International Ferry handling containers, vehicles and passengers
1 North	400	340,000	850	-
2 North	380			
South	410	590,000	750	-
3 North	460			
South	440	760,000	850	-
4 North	235			
South	540	650,000	850	-
Central Wharf	640	480,000	750	-
	3,505	2,820,000	810	-

9. In general the proposed operational improvements will bring the throughput of the port to 850 tons/lin m/berth, except on Pier 2 where only one new transit shed is being provided and the Central Wharf which will handle sawn timber imports. These are expected to achieve 750 tons/lin m. The improvements largely reflect the improved flow of traffic expected to result from the reorganization, plus the ability to work some overtime with the aid of improved lighting, if required. The overall capacity for break bulk cargo will therefore be about 2.8 million tons. This will be available about January 1979 (work on Piers 3 and 4 cannot commence until mid-1977). The anticipated break bulk cargo to be handled over the general cargo wharves will decline in 1978 as a result of increased containerization; in 1979 it will be about 2.15 million tons, if containerization proceeds at the predicted rate. There will therefore be spare capacity. It should be noted, however, that no new break bulk cargo handling facilities are being provided, the proposed works being limited to new transit sheds, paving, and improved track layout on existing piers. Lighterage will not be required when Piers 3 and 4 come into service after rehabilitation, but will be necessary over the period 1977/79, while work on these piers is in progress.

KOREA

APPRAISAL OF A FIRST PORT PROJECT

Project Details at Busan and Mukho, and Capacity of Specialized Berths

Busan (Map No. 2)

1. Dredging (Map No. 2)

1. The dredging to be undertaken is to provide access to the Composite Pier (Item 2) and Pier 7 (Item 3). In the outer harbor, the existing entrance channel is to be deepened to 13.5 m. Inside the two breakwaters a channel is to be dredged to the Composite Pier with 12.5 m water and this will be widened to provide turning space; the new container and grain berths will be dredged so as to have 12.5 m water alongside (50,000 dwt ships). A separate channel is to be dredged leading from that described above to the new Pier 7 and will have 10 m water (max. 15,000 dwt ships); berths at Pier 7 will be dredged to give 10 m and 7.5 m water alongside.

2. Only minor dredging is being undertaken to the existing piers and their approaches.

3. The total quantity to be dredged is 8.4 million m^2.

2. The Composite Pier (Maps Nos. 2 and 4)

4. This new 315,000 m^2 reclaimed area at the Northern end of the inner harbor will be used for handling containerized traffic and incoming bulk grain.

A. Bulk Grain Berth

5. Approximately 15,000 m^2 will be used to build grain storage silos of 70,000 ton capacity fed by an elevated conveyor from two 400 tons per hour (TPH) grain unloaders. A 260 m berth with 12.5 m depth of water alongside will permit 50,000 dwt bulk carriers to be accommodated. Delivery will be either bulk or bagged to rail or truck at 250 TPH. With an average of 40,000 dwt vessels about 50 ships per annum will call by 1986. Assuming 80% efficiency of the unloading system and 20 hours available per day, 12,800 tons can be offloaded per day and total time required will be about 156 days, equivalent to 40% berth occupancy.

B. Container Berths

6. The pier will provide 300,000 m^2 storage area and 600 m of container ship berths with 12.5 m water alongside. This can accomodate two large 2,000 container capacity vessels (275 m long) or four 200 container capacity feeder vessels (130 m long). Both these berths, and that for the bulk grain ships, will have cellular concrete block quay walls, filled with quarry rubble and founded on rock, with quarry rubble provided behind the wall for stability. The fill required for the reclaimed area will be obtained from the dredging (Item 1) and pumped into place. The fill material is not of high quality and will require special drainage techniques (sand or paper drains) and to be surcharged, after placement of sand and gravel blankets, in order to ensure sufficient consolidation for container storage. Surplus spoil from dredging over and above that required for the Composite Pier and Pier 7 (see 3 below) will be pumped alongside the Composite Pier behind a temporary sea wall, and can be used as a basis for any extension of the container berths required in future.

7. Four 30 ton container cranes, supported on tracks on the quay wall and the rubble fill behind it, will be provided on the 600 m berth. Approximately 50% of containers handled are expected to be chassis type and the balance will need to be stacked. For stacking, seven 30 ton transtainers together with 16 tractor/trailers and three 20 ton forklifts to place containers into stack and remove them for delivery or vice-versa, will be provided.

8. The area available for stacking about 20 ha is calculated on the basis of a requirement for 8 ha per berth for chassis type and 3.5 ha per berth for stacking. Thus, the available area will provide adequate space based on an approximate 50/50 division between stacking and chassis type containers.

9. The reclaimed area will be paved and will have adequate rail tracks and road vehicle access. A building (20 m x 50 m) for stuffing and unstuffing containers with loads for more than one consignee will be provided together with customs and operating buildings.

10. The berth occupancy of the 600 m container berth is expected to be 45% and the tonnage handled per 300 m berth about 900,000 p.a. in 1981 as calculated below:

Total loaded containers per annum in and out	164,000
Total tonnage in and out	1,815,000
Average tonnage per container	11
Overall total containers, including empties	204,000

Estimated Distribution of Container Trade, Type of Ship and No. of Ships per Annum

Country	Tonnage	Container Ship Type (Container Capacity)	Length of Ship/1	Total Containers per Ship Loaded and Unloaded	Tonnage Handled per Vessel	No. of Ships per Year	Total Ships including for Empties
	Million Tons	Number	m	Number	Tons	Number	Number
Japan	1.0	200	145	400	4,400	225	280
USA	0.5	2,000	305	2,000	2,200	23)	46
Europe	0.3	2,000	305	2,000	2,200	14)	
	1.8					262	326

/1 Including berthing space.

Time to Unload/Load Vessels

	200 Container Ship	1,000 Container Ship
Towing and Preparation (hours)	1-1/2	2
No. of Cranes	1	2
Containers per hour	16	30
Loading and Unloading (hours)	25	67
Preparation for Sailing	1-1/2	2
Total Hours	28	71

Berth occupancy will be 4 berths occupancy equivalent.

	Hours to Unload	Equivalent Hours on 4 Berths Equivalent
280 x 28	7,840	7,840
46 x 71	3,260	6,520
Total Equivalent Hours		14,360
Add 10% for Operational Inefficiency		1,440
Total Equivalent Berth Occupancy Hours		15,800
Berth available hours: 4 x 365 x 24		35,000
Berth Occupancy		45%

With 400,000 containers in 1986 as forecast, berth occupancy will clearly be too high but there is ample time for expansion before that date, if required, and the Bank considers that experience on the actual rate of expansion of containerization should be obtained before additional investments are made.

3. Pier No. 7 (Maps Nos. 2 and 5)

11. This pier, with a total area of 35,000 m^2, is to be built out from the shoreline in the northern part of the harbor. It will have one 135 m berth for coal imports and one 185 m berth for scrap metal and heavy steel billet imports, each with 10 m water alongside (6,000 - 15,000 dwt ships) on the southern face, and two berths totalling 180 m for minerals and ore exports with 7.5 m water alongside (2,000 - 5,000 dwt ships) on the western face. There will be no berths on the east side, which will have only a temporary rubble sea wall to retain the fill.

12. Construction will be generally as described for the Composite Pier, using hollow concrete block walls for the berths, and hydraulic fill from the dredging to reclaim the required area; but selected fill will be used in some areas under the heavy stacker/reclaimers. Coal shipments, with the short sea haul from Mukho, can be scheduled. Storage areas and handling systems for the different materials to be handled will be provided as follows:

Material	Coal	Scrap	Steel Billet	Ores & Mineral
	Import	Import	Import	Export
Annual quantity 1981	1,600	470	680	800
Tons '000 1986	1,650	470	680	910
Means of unloading or loading	2 - 300t/hr rail-mounted grabcanes to hoppers	2-12t at 25m radius rail-mounted, level luffing cranes		Rail-mounted 300t/hr mechanical loader
Daily unloading capacity (20 hrs)	9,000 t	4,000 t		4,500 t
Amount to be stored	130,000 t	-		40,000 t
Method of placing in/receiving from store	1 Stacker & conveyor 600 t/hr	Cranes provided for unloading		Elevated rail track and front end loaders
Delivery method from store	Reclaimer & conveyor 4,800 t per day to hoppers for truck loading	Normally direct delivery to lorry or lighter		hoppers, front end loaders & conveyor
Berth length	135 m	185 m		180 m

4. Pier 1 and International Ferry Terminal (Maps Nos. 2 and 6)

13. The new International Ferry Terminal on the south side of Pier 1 will require a widening of the existing 95 m wide pier structure by a further 101 m. The structure will be of reinforced concrete deck supported on concrete piles in view of the heavy loads that will be imposed by the terminal building.

14. A ramp to accommodate roll-on/roll-off, truck/trailer container traffic has been provided, with parking areas for transit storage. The ferry terminal building (220 m x 45 m) is a three-story structure containing cargo storage areas, offices, space for shops and other concessions and facilities for customs and immigration processing. The building and land access ways have been designed so that handling of passenger vehicles, foot passengers, and cargo vehicles will be kept separate to the greatest degree practical. Cargo handling will take place on the ground floor level. Incoming foot passengers and passenger cars will utilize separate ramps on the second floor level, and outgoing foot passengers will be processed on the ground floor and will board the ferry from the third floor level. Outgoing passenger vehicles will board on the second floor level after all incoming vehicles have been cleared.

15. In order to increase the efficiency of the north side of Pier 1 for handling general cargo, repairs are to be made, lighting installed, and resurfacing of backup areas carried out where needed. In addition, the existing transit sheds will be replaced by two new enclosed sheds of steel frame type construction. The new sheds will be placed so that improved (20 m wide) apron space for cargo handling is available. Relocation of rail and road access to the storage areas on the north side of the pier is included. Fencing will be provided to separate the new ferry terminal from other wharf operations.

5. Coastal Ferry Terminal

16. The coastal ferry terminal to be provided at the Pukbin Wharf adjacent to Pier 1 comprises two new 135 m x 50 m finger piers and two new ferry terminal buildings, each about 50 m x 20 m. The two piers are open type construction with a reinforced concrete deck supported on concrete piles. The piers have been set at an angle to the Pukbin Wharf in order to insure unimpeded maneuvering for the ferry boats. In addition to the two piers, several small floating pontoon piers, currently located nearby, are to be relocated to the Pukbin area for use by smaller harbor vessels.

17. The Pukbin area itself will be cleared of existing structures to make way for the new terminal buildings and for land transport and pedestrian access. Repairs to seawalls and other remaining structures will be effected where needed and the backup area and access roads paved and laid out to ensure smooth traffic flow. The two terminal buildings are reinforced concrete post and beam type construction with concrete brick filler walls.

6. Pier 2

18. Upon completion of the new International Ferry Terminal, use of the old terminal on the north side of Pier 2 will be discontinued and the terminal building converted to a transit shed.

19. The remaining work on this pier, which is 420 m long by 120 m wide, comprises improvement to rail trackage, removal of some tracks, repairs to sheds and installation of electricity, and improvements to the paving and utilities. The pier has 9 m of water available alongside (8,000-10,000 dwt ships).

20. The revised capacity of the port for general break bulk cargo, after completion of the project, is discussed in Annex 5.

Mukho (Map No. 3)

1. Coal Piers and Mechanical Loading Equipment

21. The existing arrangement comprises two central structures on which feed conveyors are mounted and two coal berths built out from these, formed of concrete caissons on a rubble stone foundation; the foundations project

beyond the base of the caisson and prevent the deeper drafted ships tying up alongside.

22. The center structures will be retained, but new loading piers of cellular concrete blocks will be constructed in front of the existing berths; these will be 135 m long and varying width; the wider portions to accommodate the radial track of the new loaders; depth of water alongside will be 8.5 m (8,000 dwt) ships. Necessary dredging (29,000 c^3) to give the required depth will be done.

23. Three - 300 ton per hour loaders with telescopic arms to accommodate the varying width of ships used in the coastal coal trade (max. 6,000 dwt) are to be provided on the new berths. These will be fed from the existing feed conveyors, which require some rehabilitation. A further loader can be provided on Pier "B" if and when necessary.

24. The existing coal yard is adequate in size as are the means of delivery materials thereto, but the existing conveyors which feed the conveyors to the loading piers are not satisfactory and limit the loading rate. Two new reclaimers and conveyors will be provided, one 600 and one 300 ton per hour capacity. These will handle coal or limestone. The present method, whereby coal is stored in separate piles for each owner (producer), is to be discontinued with appropriate alteration in documentation.

25. Traffic in 1981 and through to 1986 is estimated at 3.1 million tons, including limestone. Loading capacity at 80% mechanical efficiency is 720 tons per day, and with allowance for 20 hours daily operation some 10,000 tons per day can be handled at Pier A and 5,000 tons per day at Pier B. Thus, with 2/3 of total tonnage loaded at Pier A, occupancy of each pier will be about 200 days from 1981 to 1986 (56%). These are high occupancy figures for single berths, but given the short sea distances involved for each trade, limestone to Pohang and coal to Busan, schduling of sailings will be possible.

2. Breakwater

26. The existing breakwater consists of an old section of concrete block work and caissons on a rubble base with a +2.8 m elevation crest; and a new section with a concrete cap on rubble foundation, protected on its outer slope by 20 ton tetrapod units with an elevation of about +4 m. The old section will be raised by constructing a rubble mound over it to +5 m elevation (after removal of some of the existing concrete) and a layer of tetrapod (or equivalent) units will be placed on the seaward side and carried over into the harbor to dissipate the energy of any overtopping waves.

3. Rehabilitation

27. The rehabilitation works on the general cargo and central wharves are largely paving improvements, with removal and replacement of some bollards.

ANNEX 7

KOREA

APPRAISAL OF A FIRST PORT PROJECT

Proposed Development Study

1. The proposed project will provide all necessary development of the port of Busan and Mukho to handle forecast traffic to 1986, except for the rehabilitation of Piers 3 and 4 and the Central Wharf which is expected to be carried out by KPA when the Military Wharf has advanced sufficiently to permit work.

2. Economic development in Korea is expected to continue during the Third Plan Period 1972-76 at the rate of 8.6% per annum. This will involve development of industries in different parts of Korea and is expected to require development of some of Korea's first class ports other than Busan and Mukho.

3. A study is therefore proposed to be undertaken by consultants, to commence January 1974 and report by December 1974 which should:

(a) update the traffic estimates for Korea's first class ports which were prepared by the Study Group, in the light of the Government's proposed development and location of industries under the Third Five Year Plan, 1977/81 and to 1986 to the extent this information can be ascertained;

(b) consider the best methods of handling the resulting increases in imports and exports through Korean ports, having regard to available rail, road and port facilities, and so as to give the least economic cost;

(c) advise on the appropriate developments of Korea ports with sufficient preliminary engineering to enable costs to be determined within $\pm$ 20%; and

(d) estimate economic benefits of any proposed investments, the actual economic return, and the effects of the proposals on KPA's finances.

It is expected that sufficient information to indicate a likely future project will be available by September/October 1974.

May 22, 1973

KOREA

APPRAISAL OF A FIRST PORT PROJECT

Traffic and Containerization

A. Shipping and Passenger Traffic

1. 4,451 ocean going ships called at Busan during 1971 with a total gross registered tonnage (GRT) of 15.3 million tons, corresponding to an average 3,450 GRT per ship. The number of coastal ships was 15,171 with a total GRT of 3.6 million (average 260 GRT per ship). The average size of coastal vessels has increased together with growth in port traffic. Table 14 gives details on the development of vessels during the period 1962-71.

2. In 1971, a total of 3,194 vessels called at Mukho, of which all except 311 were classified as coastal (Table 14). As for Busan, the average size of coastal vessels has increased considerably during the period 1962-71 (Table 14), indicating a relative decline in the share of small (fishing) vessels with a GRT of less than 100 tons. Practically all vessels calling at Mukho had a GRT less than 5,000 tons, while vessels exceeding 5,000 GRT represented about 55% of the total tonnage calling at Busan in 1971.

3. Busan serves a substantial coastal passenger traffic (2.0 million passengers in 1971), and is the Korean terminus for the rapidly expanding ferry traffic 1/ between Korea and Japan. Busan increased its share of the total coastal passenger traffic from 20.4% in 1967 to 31.5% in 1971 with an annual growth rate of about 10%, while the total coastal passenger traffic decreased slightly (Table 16). The ferry traffic between Korea and Japan remained fairly stagnant during the initial years of operation, but since 1970 there has been a rapid increase in number of passengers, which are expected to amount to almost 50,000 in 1972.

4. Coastal passenger traffic through Busan is expected to increase annually by about 4% during the period 1972-86, and amount to about 3.5 million by 1986. The passenger traffic between Korea and Japan is expected to increase by 10% a year during the same period and amount to 185,000 in 1986 (Table 16).

5. There has been no passenger traffic through Mukho port in the past and it is most unlikely that such traffic will develop in future due to (i) the continued improvement of the land transport connections between Mukho and the major population centers and (ii) geographical features.

1/ The ferry carries both passengers and freight (roll-on/roll-off); freight traffic is discussed in paragraph 36 below.

B. Freight Traffic

Present and Past Traffic

6. In 1971, Busan port handled 10.9 million tons of freight, of which 2.0 million tons were exports, 4.9 million tons imports, and 4.0 million tons coastal shipments. These volumes represented 47.1% of total Korean exports (4.2 million tons) in 1971, 17.2% of total imports (24.3 million tons) and 18.0% of total coastal shipments (22.5 million tons) (Tables 1 and 15).

7. In the same year, Mukho port handled 3.3 million tons of freight, of which exports, imports, and coastal shipments represented 0.7, 0.2, and 2.4 million tons, respectively. Mukho's share of the Korean foreign trade was negligible, but it accounted for 10.9% of the total coastal shipments.

8. Table 15 gives details on the composition of freight traffic through Busan and Mukho ports during the period 1967-71; the composition for 1971 is summarized below:

Tons '000

	Busan	Mukho	Total for Korea
Exports			
Liquid bulk	20	-	340
Dry bulk	658	704	2,119
General cargo	1,299	3	1,733
Sub-Total, exports	1,977	707	4,192
Imports			
Liquid bulk	303	21	12,651
Dry bulk	2,222	68	7,335
General cargo	2,347	81	4,271
Sub-total, imports	4,872	170	24,257
Coastal Shipments			
Liquid bulk	2,103	152	14,557
Dry bulk	1,670	2,256	3,130
General cargo	300	36	1,795
Sub-total, coastal	4,073	2,446	22,525
TOTAL TRAFFIC	10,902	3,323	50,974

9. At Busan, exports, consisting mainly of general cargo, ores, and cement, grew about 17.5% p.a. during 1967-71, compared with 24% p.a. for total Korean exports. During the same period, imports, consisting mainly of timber, grain, general cargo and scrap iron, grew at a rate of 7.9% p.a., while coastal shipments, consisting mainly of petroleum products, coal and cement, increased at a rate of 23.9% p.a., consistent with the rapid expansion of industries in the Busan area.

10. At Mukho, exports, consisting of cement and coal, grew at a very high rate of 42% p.a. during 1967-71; however, this growth rate is not very meaningful because of the low level of exports in 1967 (173,000 tons). The growth has been a result of an increase in cement exports; the export of coal has remained constant. Imports more than doubled during the same period, but for similar reasons, establishment of any growth rate is not meaningful. Similar to exports, practically all coastal shipments at Mukho consist of cement and coal (92% of total). These shipments grew at an annual rate of 13.9% during 1966-71 1/ and were mainly directed to Busan.

Traffic Forecasts and Containerization

11. The freight traffic forecasts 1972-1986 for Busan and Mukho ports have been presented in Tables 17 and 18, respectively. They are also presented in Tables 19 and 20 for the period 1972-81, but regrouped by type and facility of cargo handling in each of the two ports. These forecasts are summarized as follows:

1/ Year 1967 is not representative due to exceptionally high shipment of coal, 1.6 million tons in that year compared with 1.1 million tons in 1968.

Tons '000

	Busan			Mukho		
	1967	1981	1986	1976	1981	1986
Exports						
Liquid bulk	-	-	-	-	-	-
Dry bulk	800	1,245	1,385	1,850	2,600	3,550
General cargo						
- Containerized	550	1,435	2,385	-	-	-
- Non-cont.	580	570	500	5	5	10
Subtotal, exports	2,230	3,250	4,270	1,855	2,605	3,560
Imports						
Liquid bulk	430	760	1,250	60	90	150
Dry bulk	3,450	4,375	5,560	65	120	145
General cargo						
- Containerized	550	1,000	1,400	-	-	-
- Non-cont.	1,565	1,085	1,055	10	15	15
Subtotal, imports	5,995	7,220	9,265	135	225	310
Coastal Shipments						
Liquid bulk	3,900	6,870	11,150	540	910	1,350
Dry bulk	2,350	3,200	4,300	3,705	5,005	5,680
General cargo	710	1,040	1,040	55	55	55
Subtotal, Coastal	6,960	11,110	16,490	4,300	5,970	7,085
TOTAL FREIGHT	15,185	21,580	30,025	6,290	8,800	10,555

The basis of the forecasts is provided in Section C below.

12. The forecasts have been based on an average overall economic growth rate of 8.6% p.a. (para 2.02), and on the detailed evaluation made by the Study Group, which has been reviewed and updated by the Bank. According to these forecasts, the freight handled at Busan will increase at an annual rate of 7.0% during the period 1971-86, compared with a growth rate of 13.8% p.a. experienced 1967-71. The exports are estimated to increase annually by 5.3%, while the growth rates for imports and coastal shipments have been estimated at 4.4% and 9.8%, respectively. The high growth rate in coastal shipments is explained by the rapid increase in inbound and domestically supplied coastal shipments of cement and petroleum products. Development of general cargo containerization is discussed separately in paragraph 14.

13. At Mukho, the total freight handled has been estimated to increase annually by 8.6% over the period 1971-86 with a major increase of 13.6% p.a. during the first five year period 1971-76, due to the expansion of the Ssanyong cement plant, followed by a lower growth rate of 5.9% p.a. during the remaining period 1976-86. The annual growth in exports, imports and coastal shipments

has been estimated at about 11.4%, 4.0% and 7.8% respectively over the whole period 1971-86, but with coal exports remaining constant at 2.1 million tons after 1976.

Containerization

14. The exports and imports of general cargo at Busan are being rapidly containerized. The number of loaded containers was 1,427 in 1970 with about 15,000 tons of cargo. In 1971, the number of loaded units had increased to 13,443 with about 150,000 tons of cargo. The rapid increase continued during 1972 with an estimated number of 21,500 containers excluding empty containers loaded with 275,000 tons of cargo (Table 17). At the initial stages of containerization, the number of loaded inbound containers was about twice the number of outbound units, reflecting the advanced containerization level in the major industrial countries (Japan and U.S.) exporting to Korea. This situation is, however, being reversed with the rapid increase in exports of products highly suitable for containerization (textiles, electronics) and the increasing preference for unitized cargo handling. As elsewhere in the world, two distinct container shipping patterns have emerged:

(a) roll-on/roll-off (ro-ro) type of services for the short-to-medium distance shipments between Korea and Japan. These services are provided by a combined passenger/motor vehicle ferry (para 3); and

(b) shipment of containers on longer routes by use of specially designed vessels, or by use of conventional general cargo vessels, some of which have been converted to suit the particular requirements of container transport.

In 1972, about 2/3 of the total container traffic at Busan was handled by the ro-ro ferry service, while the remaining 1/3 was shipped by ocean going vessels (Table 19).

15. The estimated development of container traffic at Busan 1972-86 is given on Tables 17 and 19, and summarized below:

	Number of Loaded Containers, Thousand			Cargo, Thousand Tons		
	1976	1981	1986	1976	1981	1986
Exports						
Ferry, Korea-Japan	28	28	28	310	310	310
Ocean going vessels	20	102	172	240	1,125	2,075
Subtotal	48	130	200	550	1,435	2,385
Imports						
Ferry, Korea-Japan	28	28	28	310	310	310
Ocean going vessels	20	62	97	240	690	1,090
Subtotal	49	90	125	550	1,000	1,400
Total Loaded	96	220	325	1,100	2,435	3,785
" Empties	0	40	75			
Total Overall	96	260	400			

The volume of general cargo 1/ is estimated to increase from 1.8 million tons in 1972 to 4.5 million tons in 1976 (Table 17), implying an annual growth rate of 6.2%. The container traffic will increase at a considerably higher rate of 14.0% p.a. since increasing proportions of general cargo exports and imports will be containerized. The forecasts assume that specialized container vessels will handle the increase in traffic after 1976, while the traffic on the Korea-Japan ro-ro ferry will remain constant at the 1976 level. This will provide the least cost solution.

C. Basis for Freight Traffic Forecasts

16. The bases for the traffic forecasts, as summarized in para 11, are discussed by main commodities in the following. The estimated future development is essentially based on the evaluation made by the Study Group as reviewed by the Bank and on information obtained from relevant industries and Government agencies. As a whole, the forecasts have been geared to the Third Five Year Plan development targets.

I. BUSAN

Exports

17. Between 1967 and 1971, exports increased annually by 17.5%, from 1.04 million tons in 1967 to 1.98 million tons in 1971. The exports are estimated to increase to 4.27 million tons by 1986, giving an annual growth rate

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1/ Excludes scrap metals, steel and pulp which were included in general cargo volumes summarized in paras 8 and 11.

of 5.3%. The high growth rate during 1967-71 is explained by: (i) the low initial level of exports in 1967, and (ii) a rapid increase in exports of various manufactured products, notably of textiles and electronic components. The estimated future growth of exports is summarized in Table 17.

18. Cement: The export of cement through Busan port was 315,000 tons in 1971, and is expected to continue at its present level; Mukho will handle most of the export volume. Cement exported through Busan is mainly destined to Southeast Asia and is shipped as backhaul on log carriers.

19. Coal: Minor quantities of coal, 30,000 tons in 1970, have been exported through Busan. This export movement is expected to discontinue and will be concentrated at Mukho.

20. Ores and Minerals: Exports of ores and minerals, comprising such raw materials as quartz, feldspar, kaolin, tale, etc., totalled some 650,000 tons in 1971. More than 90% of these quantities have been for Japanese destinations, with Busan as the most important loading port. This situation is not expected to change. The shipments through Busan are expected to be 750,000 tons in 1986, in line with a slight overall increase in exports of these commodities.

21. Plywood: The export of plywood through Busan totalled 220,000 tons in 1970. The volume increased at the high rate of 25% p.a. during the latter part of the 1960's and was directed mainly to the U.S. market. The rapid increase took place at the expense of Japanese exports; by beginning of the 1970's, the expansion possibilities were, however, considerably reduced, and any future increase will be dictated by the growth in demand in importing countries. Moreover, it seems likely that the Government will be less inclined to give high priority to this part of the exports due to its high foreign raw material content, while plywood industries are being developed in the major timber exporting countries. Therefore, plywood exports have been predicted to increase at a much lower rate of 3.0% p.a., reaching about 335,000 tons at Busan in 1986.

22. General Cargo: The export of general cargo as a total is expected to increase from 340,000 tons in 1970 to about 2.9 million tons in 1986, implying an annual growth rate of 15.4%. The high growth rate is in line with the general development policy to promote manufacturing industries which will capture an increasing share of total exports. The major export commodities with an estimated high annual growth rate are:

(a) Fish and fish products; Korean exports are estimated to increase from 108,000 tons in 1970 to 316,000 tons by 1976; projections are difficult beyond 1976, but the growth trend is expected to continue due to the strong demand on the Japanese market;

(b) Textiles; Korean exports of textiles were 68,000 tons in 1970 and are expected to increase at an annual rate of 21.5% reaching 220,000 tons by 1976;

(c) Glass, refractories, ceramics, porcelain: The manufacturing of these products started on a larger scale in the late 1960's, with exports as low as 1,000 tons in 1968. However, it had increased to 40,000 tons by 1972, and is expected to reach 170,000 tons by 1976; thereafter a growth in exports of some 20% p.a. has been assumed. As for most of the Korean exports, the main markets for these products are Japan and US;

(d) Electronic components, electrical machinery and appliances: Electronic components represent, besides textiles, the most important growth industry in Korea. Export was only US$7 million in 1967, by 1970 exports had increased to US$55 million and exceeded US$100 million the next year. These exports are expected to reach US$450 million by 1976, and may, under favorable circumstances, be even higher. In addition to electronics, the electrical machinery and appliances industry is expanding rapidly and is expected to show a similar growth in exports; and

(e) Others: Other products with an expected rapid export growth are various products of petro-chemical industry, including chemical elements and materials which are expected to grow from 32,000 tons in 1972 to 163,000 tons in 1980, and artificial plastics increasing from 115,000 tons in 1972 to 415,000 tons in 1980. Leather products and footwear, as another example, will increase from 44,000 tons in 1972 to 257,000 tons in 1980.

Imports

23. Between 1967 and 1971, imports increased annually by 7.9%, from 3.59 million tons in 1967 to 4.86 million tons in 1971. Two products, grain and timber, together increased from 1.09 million tons in 1967 to 2.42 million tons in 1971 and accounted for most of the growth. The estimated future growth in imports is summarized in Table 17. By 1986, the total imports through Busan should approximate 9.25 million tons, giving an annual growth rate of 4.4%.

24. Coal: Coal produced in Korea is not bituminous; and is therefore not suitable for coking purposes. In addition, it is not of high quality and is used mainly as briquettes for domestic purposes. Bituminous coal has therefore been imported through Busan in minor quantities; this is expected to continue, amounting to about 200,000 tons in 1986. Shipments from Mutaho, about 900,000 tons in 1972 are expected to rise to 1.45 million by 1981 and remain constant thereafter.

25. Ores and Minerals: The imports of ores and minerals will increase from about 50,000 tons in 1972 to about 160,000 tons in 1986, and consist mainly of salt and asbestos.

26. Scrap metals: In 1970, 588,000 tons of scrap metal were imported at Busan, mainly for the Busan steel mill. This level is expected to decline slightly to about 470,000 tons in 1986 due to increased use of iron ore and the major expansion of other steel mills in the country.

27. Steel: The import of steel is expected to decrease from some 420,000 tons in 1972 to 240,000 tons in 1986 due to the commencement of domestic production in 1972. However, imports of some types of steel will still be required.

28. Grain: Grain imports are estimated to increase from a level of about 1.1 million tons in 1971, to about 2.0 million tons by 1986, implying an annual growth rate of 4.0%. The import of grain is expected to continue, even acknowledging the Government's plan to reach self-sufficiency in the major food grains. However, part of the estimated grain import during 1972-86 may represent coastal shipments, because Busan represents an important distribution center of both imported and domestic grain.

29. Timber: The import of timber amounted to 1.17 million tons in 1970 and is expected to increase to 3.2 million tons by 1986, giving a growth rate of 6.5% p.a. The increase is warranted because of a continuous expansion of woodworking and construction industries and depletion of domestic forest resources.

30. Pulp: Import volumes of pulp will more or less remain constant at their present level of about 140,000 tons. Although Korea is expected to import more pulp the increase in imports will take place through other ports.

31. General Cargo: In 1970, 1.3 million tons of general cargo was imported. It is expected to increase to 1.6 million tons by 1986, or by a low 1.4% p.a., which reflects the expected rapid development of import substitution industries and the Government's efforts to curb growth in imports.

32. Petroleum Products: Most of the fuels represent coastal shipments from the refinery at Ulsan. About 230,000 tons, or 12% of the total, was, however, imported. The import of petroleum products is expected to continue at a level of 10% of total shipments through Busan. By 1986, about 1.25 million tons will be imported, giving an annual growth rate of 11.1%.

Containerization

33. The Study Group based its recommendations on containerization on extensive studies on the structure, future development and transport costs of general cargo. The conclusions are sound, though conservative. The actual development during 1972 resulted in a considerably larger container traffic than predicted. Discussions with representatives from shipping lines and manufacturers indicate that this growth trend will continue. On this basis the Bank adjusted the forecasts to reflect a faster rate of increase.

34. Containerization results in substantially reduced transshipment costs for most products with relatively high value-volume relationship (US$200 per ton and above). The Study Group's evaluation indicates that about 85% of the general cargo shipped through Busan consist of containerizable products with the following estimated containerization rates:

1972 = 15%

1976 = 50%

1981 = 75%

1986 = 85% (full containerization)

35. The reduced transshipment costs result from the application of mass or systemized handling techniques to the distribution of goods with the following main results:

(i) standardization of product handled;

(ii) faster movement between points of transshipment;

(iii) faster transshipment; and

(iv) reduced damage and pilferage.

Containerization results in cargo handling costs, which are considerably lower than those for conventional general cargo handling and shipping. However, these lower handling costs are obtained through substantially larger investments in equipment and ships. Further, the cost savings depend on the trade route in question. In the Korea-Japan trade where the port and other handling costs represent more than 50% of total transport costs, the relative cost savings are substantially higher per ton handled than in the Korea-US trade, where the direct shipping cost is the largest item. The Study Group's evaluation, with which the Bank concurs, resulted in following relative total system costs for the two main trade routes:

	Korea-US Trade	Korea-Japan Trade
Conventional shipping		
- present cargo handling	100	100
- optimum cargo handling	88	92
Pallets	70	76
Lash	84	44
Ro-Ro	-	37
Containers, optimum ship size	40	28

Thus, containerization will reduce the total transport costs per ton to about 1/3 of its present level. The cost savings between conventional and containerized shipping were calculated to be distributed between the various cost components as follows:

	Korea-US Trade %	Korea-Japan Trade %
Shipping	16.1	49.0
Port	10.4	26.8
Inland	2.9	4.0
Inventory	1.7	4.0
Packaging	1.7	3.0
Others	67.2	13.2
Total Cost Saving	100.0	100.0

The cost item "Others" refers to cargo handling costs in overseas ports. These costs are very high for breakbulk in U.S. West Coast ports, i.e., US$35.00 for loading and US$44.00 for discharging, compared with US$8.20 and US$4.75 respectively in Japanese ports.

36. As shown in Table 19 the increase in container traffic between Korea and Japan after 1976 is allocated to specialized container ships, while the container traffic on the international roll-on/roll-off ferry would remain constant. This allocation was carried out on basis of a cost advantage of about 20% in terms of total system costs (from point of origin to point of destination). The Study Group correctly concluded, however, on basis of experiences from several similar trade routes in Europe, that the total cost advantage may not be that high. The cost difference in favor of container ships arises mainly from an assumed use of trailers in shipping the containers on the ferry. In actuality, the containers may be shipped in a similar way on both types of ships, and the cost difference may largely be compensated by faster turn-around times and a reduced need for large back-up areas. No revision was, however, made in the container traffic allocation, because the same port facilities may be used by both systems.

II. MUKHO

37. Mukho is essentially a two-commodity port. In 1970, about 93% of the total traffic consisted of cement and coal. By and large this situation will continue in the future as discussed below.

Outbound Shipments

38. Between 1967 and 1971, outbound shipments increased from 1.61 million tons to 2.97 million tons or by 16.5% p.a. The whole of this increase was accounted for by cement shipments. In 1967, about 46,000 tons of cement was shipped, all in the coastal trade. By 1971, the shipments of cement had increased to 1.48 million tons, of which 700,000 tons was

exported. Coal shipments showed a considerable fluctuation, but remained essentially constant at an annual level of about 1.5 million tons. Outbound shipments of other commodities amounted to an insignificant 53,000 and 27,000 tons in 1967 and 1971 respectively.

39. The total outbound shipments are expected to increase to about 9.5 million tons by 1986, implying an annual growth rate of 8.1%. Cement, coal and limestone will account for the whole of this increase (Table 18).

40. Cement: The present capacity of the Ssanyong cement plant is about 2.0 million tons, which was fully utilized in 1972. The expansion of the cement plant will be completed by the beginning of 1974, when the total production capacity will be about 3.0 million tons. A further expansion is planned to be completed by the early 1980's. Until 1970, cement export was insignificant. Since then exports have increased very rapidly and almost equalled the coastal movements in 1972. The increase in cement exports is expected to continue and reach 3.25 million tons in 1986. The forecast for the next few years is based on relatively firm export contracts. However, the long term export possibilities also appear to be promising due to economies of scale and limitations in the expansion possibilities of cement plants in Japan and US. However, domestic shipments are expected to expand noticeably as well, with an annual volume of 2.75 million tons in 1986, and growth rate of 6.4%, compared with 8.8% for exports.

41. Coal: The export of coal (to Japan) will remain constant at an annual level of 300,000 tons over the whole period. The coastal shipments are expected to increase over the period 1971-86 and reach 2.5 million tons by 1981 which corresponds to the expected increase in domestic (household) consumption and remain constant thereafter.

42. Limestone: Limestone shipments are expected to start during 1973 to meet part of the total requirements of the Pohand steel mill. These shipments are expected to reach 265,000 tons by 1976, and stabilize at a level of 565,000 tons by 1980.

Inbound Shipments

43. Between 1967 and 1971, inbound shipments increased from 90,000 tons to 346,000 tons, mainly as a result of a rapid increase in fuel movements, which amounted to half of the total inbound cargo in 1971.

44. The inbound shipments are expected to increase to 1.86 million tons by 1986, giving an annual increase of 11.8%. Fuels and iron ore will account for all of this increase. Both of these commodities will be required as production inputs for the cement plant.

May 22, 1973

KOREA

APPRAISAL OF A FIRST PORT PROJECT

Calculation of Economic Return

A. Procedures

1. The calculation of Economic Return (ER) involved two main steps: (i) quantification of project benefits, and (ii) distribution of project benefits between the Korean economy and other beneficiaries. The procedures are summarized in the following.

Quantification of Project Benefits

2. Project benefits have been calculated as the difference in directly quantifiable port user costs with and without the project; indirect benefits, if any, which may be induced within the nonport sector of the economy were not quantifiable and have been excluded. The calculation of costs with and without the project have essentially been based on the Study Group's evaluation in which they applied cost minimization programs, dividing the total cost into the following main components:

(a) cargo handling costs in project ports;

(b) ship costs at berth;

(c) ship waiting time costs;

(d) sea voyage costs;

(e) cost of cargo handling in foreign ports; and

(f) land transportation costs.

The calculated project benefits include only cost reductions in components (a) to (d); components (e) and (f) were, however, used for selection of the optimum port and shipping system, i.e., in determination of:

(a) number of berths;

(b) loading and unloading rates of mechanical cargo handling equipment; and

(c) average ship size.

3. Cargo handling costs in port, ship costs at berth, and sea voyage costs were quantified by the consultants on basis of empirical data, which are well documented and generally reliable. These costs have been calculated as constant per ton of cargo handled over the project life. On the other hand, ship waiting time for berth is highly dependent on the ratio between traffic volume and port capacity and in addition the assumed arrival pattern and service time of ships in port. The consultants applied standard programs in the calculation of ship waiting times, according to which the waiting time is based on a Poisson (random) distribution of ship arrival times, while the ship service time was based on empirical observations, using constant service times for each major type of cargo. This program is fully acceptable at low berth occupancy ratios; however, an indiscriminate application would result in infinite ship waiting times if the traffic were allowed to exceed the actual port capacity. Infinite ship waiting times will, however, not develop in the real world, because mounting shipping costs would preclude a continuous growth in traffic and result in losses to the economy, viz:

(a) diversion of traffic to other ports at a higher cost;

(b) export opportunities lost; and

(c) slower economic growth in the port influence area.

Port traffic and ship waiting times have therefore been calculated to increase until the port capacity has been reached and thereafter remain constant. This is a valid, if conservative approach; a further increase in traffic will require additional port capacity in the form of a new investment. The benefits from such traffic increase cannot, therefore be, assigned to the port project under evaluation. Full utilization of the project ports is anticipated by 1987, and as explained above, ship waiting time costs have been kept constant for the remaining part of project life 1986-96. The result of the calculations are reflected in subsequent sections of this Annex and in Tables 21 to 26.

Distribution of Project Benefits

4. The project investment will result in considerable benefits, all of which have not been allocated to the project in the calculation of the Economic Return (ER). Only those direct benefits which are quantifiable and attributable to the Korean economy have been included, while benefits to other (foreign) beneficiaries have been excluded.

5. Benefits which are readily identified as attributable to the Korean economy represent:

(a) savings in cargo handling costs in the project ports; and

(b) savings in port and sea voyage costs of Korean flag vessels, which carry all of the coastal trade and about 25% of the dry cargo exports and imports.

In 1972, about 40% of the 8.9 million tons of dry cargo at Busan was carried by Korean flag vessels; at Mukho this percentage was practically 100%.

6. Benefits, readily identified as attributable to foreign beneficiaries consist of cost reductions in foreign ports through the use of larger vessels and containers, made possible by the improvements in the project ports. These cost reductions can be substantially higher than all the other benefits combined. As shown in Annex 8, para 35, 67% of the total cost reductions resulting from containerization in the Korean-US trade are obtained in the US ports due to significantly reduced labor costs. These benefits have been excluded in the return calculation.

7. The extent to which the Korean economy will benefit from current savings accruing to foreign vessels arising from the project will depend on the type of service involved. Benefits accruing to vessels chartered by Korean interests on a daily basis for the carriage of large volumes of bulk freight (e.g. grain) will be fully recouped by the Korean economy to the extent that port time is reduced. About 1/4 of all grain, minerals, ores, steel, scrap and general cargo is carried by foreign chartered vessels. Savings to liner vessels will accrue to the foreign carrier, but about 20% of this will be recouped through revisions in the port charges. The above distribution implies that, on an average basis, about 50% of the savings in current costs to foreign carriers will accrue to the Korean economy. For ocean traffic as a whole, this percentage would be 67%, because of the number of Korean flag carriers involved in this trade (33% of the total ocean traffic). Benefits arising from savings in additional costs in the future represented by the liner service surcharges or longer charter times which would result if the project were not undertaken will, of course, accrue fully to the Korean economy. The above distribution of cost savings applies only for Busan; the traffic through Mukho is carried by Korean flag vessels in coastal trade. Cost reductions to these vessels will naturally accrue in full to the Korean economy.

Summary of Benefit Allocation

8. In summary, the economic calculations utilize the benefits resulting from the project investment as follows:

(a) benefits to the non-port sector are excluded as non-quantificable;

(b) benefits in the form of cost reductions in foreign ports are excluded;

(c) cost reductions accruing to coastal traffic have been included fully because all freight is carried by Korean flag vessels;

(d) cost reductions in cargo handling in the project ports have been fully included;

(e) cost reductions in ocean freight under Korean flag have been fully included; this represents about 1/3 of the total ocean freight affected by the project investment;

(f) about 20% of the cost reductions to ocean freight carried by foreign liners has been included in the economic return calculation; this amount will be recouped through revised port charges; this traffic represents about 60% of the total non-Korean ocean freight traffic through Busan; and

(g) about 40% of the foreign flag ocean freight is carried by chartered vessels; cost reductions relating to the movements have all been included.

Economic Return Calculation

9. The benefits have been calculated over the period 1977-96, which may be considered as the economic life of the project. The economic return (ER) is about 32% (Table 26). With a 15% increase in costs and a corresponding slippage in benefits, the ER is about 27%. As discussed in paras 1 to 8 above, this return is based on estimated benefits to the Korean economy; the total benefits would have resulted in a considerably higher return. The first year economic return (FYR) is 16.4% for 1977 (Table 26), and the benefits for each subsequent year will increase at a rate higher than the FYR.

10. The investment cost used in the economic evaluation excluded contingencies for price escalation, is net of direct taxes and duties and represents, therefore, a real cost. Interest has been calculated during the construction period.

B. Busan

(a) Composite Pier

11. The Composite Pier, to be completed by late 1977, will provide container and bulk grain handling facilities. The container facilities will relieve congestion on the general cargo piers, while the grain handling facilities will replace the present uneconomic lighterage system for handling grain cargos.

(i) Grain

12. Grain is at present imported by use of 24,000 dwt ships, which are mainly unloaded at anchorage and lightered to shore. The average unloading rate is 1,200 tons per day (TPD). Improvement will take place without the project, however, which will result in use of 32,000 dwt vessels and an unloading rate of 1,500 TPD. With this improvement, the costs per ton handled will in 1977 be:

(a)	cargo handling costs	US$ 1.22
(b)	vessel costs	
	i. cost of vessel in port	US$ 3.07
	ii. sea voyage costs	US$ 7.26
	Total per ton	US$11.55

13. Evaluation indicates that the most economic future grain handling system will consist of:

(a) shipment with 50,000 dwt ships, with 40,000 ton average loads; and

(b) unloading at a rate of 800 TPH, by use of the new bulk handling facility located on the proposed Composite Pier.

With this system, the costs per ton handled will be as follows:

(a)	cargo handling costs US	US$0.20
(b)	vessel costs	
	i. cost of vessel in port	US$0.47
	ii. sea voyage costs	US$6.45
	Total per ton	US$7.12

The cargo handling costs do not include capital costs for mechanical equipment and grain silo, as these items have been included in the total investment cost of the Composite Pier.

14. As shown above, the savings per ton of grain handled will amount to US$4.43 in 1977. The grain is at present shipped by foreign carriers on contract, and it is unlikely that this will change, because of the large size specialized ship required. The savings to the project and the Korean economy amount, therefore, to US$2.73 per ton excluding half of the savings in ship costs. With 1.3 million tons of grain handled in 1977 (Table 19) the benefits in that year will amount to US$3.55 million. There will in future be a further increase in benefits as detailed in Table 21, due to an increase in traffic and avoided ship waiting time.

(ii) Container Facilities

15. The estimated future development of containerization of general cargo has been shown in Table 19 and detailed in Annex 8. The Composite Pier will handle all container traffic except that shipped through the international ferry terminal (para 25). Without the project, there would be only limited possibilities for containerization and therefore the benefits arise from the difference in costs of handling the freight as general cargo of containerized traffic.

16. Containerization of general cargo will result in savings of US$8.74 per ton in 1977, which will increase gradually in future due to increased ship waiting times if the project is not undertaken; details on the composition of savings is provided in Table 22, which also indicates that the savings allocated as project benefits amount to US$6.40 per ton in 1977. Total project benefits due to containerization amount to US$4.86 million in 1977, with 799,000 tons of containerized cargo.

(b) Pier No. 7

17. Pier No. 7, to be completed by beginning of 1977, will provide facilities for bulk handling of coal, other minerals, ores, steel and scrap. This pier, together with the Composite Pier, will replace the use of lighterage facilities and centralize the handling of dry bulk cargo within the port area.

(i) Coal

18. Under the present system, coal is shipped from Mukho by 5,800 dwt vessels and unloaded by lighterage at a rate of 1,800 tons/day. The cost per ton handled is US$2.58. Details are provided in Table 23.

19. The proposed bulk handling facility for coal at Busan has been designed to provide an optimum system when operated together with the mechanical loading facility at Mukho (para 23). Specifically, the Busan system consists of:

(a) inbound shipments with 6,000 dwt ships; and

(b) unloading at a rate of 600 TPH which may be increased without substantial additional investment if so required.

20. It is estimated that the cost per ton handled will be reduced to US$1.09 per ton representing a saving of US$1.49. This benefit is fully allocated to the project since the coal is shipped under Korean flag. The total saving in costs is US$1.95 million in 1977, with 1.31 million tons of coal handled. Details on the composition and development of transport costs under the present and proposed system are shown in Table 23.

(ii) Ores, Minerals, Steel and Scrap

21. Under the present system, ores, minerals, steel and scrap are shipped utilizing ships of 5,000 dwt average size, which are handled at berth and by

lighterage in approximately equal numbers. The cargo handling rate is about 100 TPH and the handling cost per ton is US$1.25.

22. The project will provide specialized export and import berths at Pier 7, which will allow handling rates of about 240 TPH. The new mechanized facilities will reduce the handling cost to US$0.46 per ton.

23. The total port costs per ton are US$2.05 under the present system, including handling costs and ship costs in port while the corresponding cost with the new operations will be US$0.83, resulting in a cost reduction of US$1.22 per ton. Details on the costs and savings are provided in Table 24.

(c) Coastal and International Ferries

24. The international and coastal ferry terminals will be completed by the middle of 1976. The international ferry terminal will be used by roll-on/roll-off (ro-ro) ferries between Korea and Japan, which will mainly handle trailer-fitted containers, and thus complement the container facilities on the Composite Pier. In addition, the ro-ro ferries will serve a rapidly increasing passenger traffic (Table 16). The coastal ferry terminal will replace the existing coastal operations, which are scattered at various temporary locations within the port area, and provide mainly passenger services between Busan and the coastal areas.

(i) International Ferry

25. The estimated container traffic on the ro-ro ferry is shown in Table 6, while details on containerization are provided in Annex 8. Evaluation indicates (Annex 8), that the shipment of containers will result in slightly lower overall transport costs by using specialized vessels and facilities provided on the Composite Pier than by using the ro-ro ferry. Therefore, it has been assumed that the increase in container traffic will take place on the Composite Pier, while the international ferry terminal will provide a constant once-a-day service over the period 1976-1986.

26. The savings in transport cost allocated to the project have been calculated to be US$4.84 per ton of containerized cargo handled and US$3.00 million total in 1977. Savings from the container traffic over the Composite Pier, will gradually increase due to increased congestion if the project is not constructed. Details are provided in Table 25. It has not been possible, for lack of data, to calculate savings to passenger traffic. These would, however, be very small compared with savings to containerized cargo, as it is calculated that savings due to ten passengers would correspond to savings on one ton of cargo. On this basis the number of passengers will be about 10% of the cargo volume in 1977.

(ii) Coastal Ferry Terminal

27. According to Table 16, the coastal passenger traffic volume through Busan was 2.0 million in 1972, and is expected to increase to 2.4 million in 1976 and to 3.6 million by 1986. No detailed information on the cost structure

of the coastal traffic is available. It has been conservatively estimated that the project will not increase ship costs, while the saving in port handling costs has been estimated at US$0.20 per passenger, which saving would remain constant over the period 1976-86. The total savings would thus be US$0.48 million in 1976, increasing to US$0.72 million by 1986.

Mukho

28. Mukho is essentially a two commodity port, with substantial shipments of coal and cement (Table 18). About 72% of the proposed works relate to the improvement of coal handling facilities, while the remaining part represents minor rehabilitation and dredging works and a major improvement of the breakwater. The economic evaluation of the project investment in Mukho port has been carried out in terms of the improvement of the coal handling facility only, and the other improvements have been treated as associated improvements.

(a) Coal

29. The project involves improvements to existing berths to accommodate 6,000 dwt vessels and an increase in the capacity of the mechanical loading facility to 1,200 TPH by early 1976. After improvement, the facility will handle, in addition to coal, increasing shipments of limestone to the steel mill at Pohang.

30. Under the present system, the average loading capacity is about 300 TPH, and in 1972, average waiting times per vessel of 35 hours were experienced; not, however, only because of the high level of berth occupancy, but also because of the lack of sufficient stock of a particular type of coal.

31. Evaluation indicates that the present coal handling cost is US$0.22 per ton, while the cost for vessel service time at berth or anchorage is estimated at US$0.35 per ton. The cost of waiting time was calculated to be US$0.52 per ton in 1972, which would indicate that the waiting time exceeded the time spent at berth.

32. The Study Group's studies on cost optimization indicated that a transport system with 6,000 dwt vessels and a loading rate of 1,200 TPH would provide the least cost solution. Even with this system, the berth occupancy would be a high 66% in 1976 and 70% in 1981, with waiting time costs per ton of US$0.05 and US$0.10 respectively. The handling costs would remain unchanged at US$0.22 per ton while the cost for vessel service time would decrease to US$0.27 per ton.

33. On the basis of the above, the cost per ton of coal handled would decrease from US$1.09 to US$0.54 in 1976, representing a saving of US$0.55 per ton. The total savings in 1976 are US$1.38 million on the basis of an estimated shipment of 2.51 million tons of coal and limestone in that year. The calculation of cost reductions for any subsequent year is not possible because the waiting time costs will approach infinity.

May 22, 1973

KOREA

APPRAISAL OF A FIRST PORTS PROJECT

Assumptions Used in Financial Forecasts

A. General

1. It has been assumed that the proposed Port Authority will commence operations in accordance with the plan of action.

2. Other assumptions are:

(a) the proposed Bank loan of US$80 million equivalent will be made to the Government and made effective about October 1, 1973;

(b) the amount of the Government loan for the Ports of Busan and Mukho will be paid back to the Government by KPA on the same terms as the loan and on the same amortization schedule;

(c) the Authority will not be required to pay income or property taxes, or import duties on equipment purchased with the proceeds of the loan;

(d) the Authority will provide and maintain all port facilities but will not conduct cargo-handling operations; it will either grant a concession, at a fee reasonably related to the proportional cost of the facilities used, or rent facilities exclusively used at a rental reasonably related to cost; and

(e) a team of Authority personnel will, as required, coordinate labor and mobile equipment, control and supervise the movement, receipt and delivery of cargo on wharves and in sheds. They will check or tally cargo and be responsible for cargo documentation, security, cleanliness of the facilities and the efficient use of shed and cargo open areas. A "service charge" will be assessed by the Authority beginning on January 1, 1976 for these and other related services provided by miscellaneous dock labor.

3. Other factors affecting the forecasts are:

(a) traffic forecasts referred to in Chapter VI. For wharfage revenues, general cargo traffic has been converted to revenue tons from metric tons by application of a conversion factor of 1.5;

(b) capital investments referred to in Chapter IV, and estimated nominal investments outside the project. The latter have been estimated conservatively, as exact information is lacking at this time;

(c) future improvements in operations, cargo handling, ship turnaround time and other changes in operating prodedures referred to in Chapter III and Annex 5;

(d) constant 1972 prices for materials and wages;

(e) straight line depreciation and rates of annual depreciation, as follows:

		Years
(i)	Breakwaters	1%
(ii)	Wharves and Piers, including Transit Sheds not separately stated	3%
(iii)	Buildings, Navigation Aids, and Tugs	5%
(iv)	Equipment, Roads and Paving	10%

(f) elimination, as of January 1, 1974, of favorable rate treatment granted without financial or economic justification to a substantial portion of traffic through exemption from charges and/or preferential rates;

(g) the assessment and collection of all charges, including port dues and service charges, by the Authority in accordance with the plan of action; and

(h) full responsibility for cargo control to be vested in the Authority, to the exclusion of all others, on non-rented facilities; and as a result, removal of long-term warehousing operations in transit sheds to more appropriate facilities. This involves the establishment, no later than January 1, 1976, the date assumed in the projections, of adequate cargo-demurrage rates to be applied after a six-day free-time cargo holding period. These rates are assumed to contain an adequate penalty element so that earned demurrage revenues are not substantial.

B. Particular

BUSAN

Specific assumption in respect of the Port of Busan are as follows:

(a) land value of Won 30,000 per Pyong in lieu of Won 100,000 as suggested by the consultants;

(b) completion and/or commencement of operations of new facilities will be on the followingdates:

June 1, 1976 - Coastal and International Ferries
Pier 1
Dredging - general waterways only

January 1, 1977 - Pier 7
Dredging, in part

January 1, 1978 - Composite Pier
Balance of dredging
Grain silo

(c) the ferry facilities and the new Composite and No. 7 piers will be rented to private enterprises, which will operate them;

(d) pier 3, (Presently Military), will be vested in the Authority on January 1, 1978; and as a consequence, its value of an estimated Won 2,930 million will be added to the Authority's assets and Government capital; and

(e) the "expansion area" of reclaimed but unimproved land which is a part of the Composite Pier set aside for future expansion, will remain unused through 1981, it is therefore retained in the Authority's assets as work in progress throughout the forecast period.

MUKHO

Specific assumptions in respect of the Port of Mukho are as follows:

(a) land values of Won 12,000 in lieu of 30,000 as suggested by consultants; and

(b) completion and/or commencement operation of new facilities and equipment on the following dates:

January 1, 1976 - Coal Pier "A"
Breakwater Improvements
Dredging - Existing Coal Pier

January 1, 1977 - Coal Pier "B"
Rehabilitation of Cement and Central Wharf

May 22, 1973

KOREA

TABLE 1

FIRST PORT PROJECT

Traffic Development 1962, 1965-1971

	Actual							
	1962	1965	1966	1967	1968	1969	1970	1971
I. DOMESTIC TRAFFIC BY MODE								
1. Freight (million tons)								
Railway	17.9	22.4	24.1	27.4	28.9	30.6	31.6	32.0
Highway	16.9	24.0	24.5	28.6	46.1	56.6	61.8	73.9
Coastal Shipping	2.0	2.7	2.7	4.2	5.6	8.1	10.5	11.3
Total	36.8	49.1	51.3	60.2	80.6	95.3	103.9	117.2
2. Freight (billion ton-km)								
Railway	4.0	5.0	5.5	6.2	6.9	7.3	7.7	7.8
Highway	0.4	0.5	0.6	0.7	1.1	1.3	1.4	3.3
Coastal Shipping	0.2	0.3	0.7	1.0	1.4	2.1	4.2	4.7
Total	4.6	5.8	6.8	7.9	9.4	10.7	13.3	15.8
3. Passenger (million pass)								
Railway	100.6	107.2	138.3	152.0	151.0	154.7	131.0	128.2
Highway	667.1	1,195.5	1,511.6	1,674.8	2,018.9	2,418.6	2,743.8	3,024.2
Coastal Shipping	4.4	5.5	5.9	6.7	6.5	6.1	5.9	6.4
Air Transport	-	0.2	0.2	0.2	0.3	0.6	0.9	1.1
Total	772.1	1,308.4	1,656.0	1,833.7	2,176.7	2,580.0	2,881.6	3,159.9
4. Passenger (billion pass-km)								
Railway	5.9	6.9	8.7	9.6	10.6	11.1	9.7	8.8
Highway	5.5	8.0	11.5	11.7	13.9	16.7	20.0	22.9
Coastal Shipping	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Air Transport	-	0.1	0.1	0.1	0.1	0.2	0.3	0.3
Total	11.6	15.2	20.5	21.6	24.8	28.3	30.3	32.3
II. OTHER TRAFFIC								
1. Port (million-tons)								
Exports	0.8	1.6	1.7	1.8	2.3	2.9	3.6	4.2
Imports	3.7	5.2	6.8	9.7	13.5	17.1	18.7	24.3
Coastal Shipping	3.1	4.6	4.6	8.3	11.2	16.2	21.0	22.5
Total	7.6	11.4	13.1	19.8	27.0	36.2	43.3	51.0
of which In Cheon (%)	17.3	12.2	14.7	14.8	15.2	15.1	8.1	18.0
PuSan (%)	43.4	38.5	40.4	32.0	26.1	22.2	21.3	21.4
2. Air								
International Pass (000)								
In	18	37	65	87	112	133	191	508
Out	20	40	66	88	116	135	201	
Domestic pass (000)	48	207	192	215	312	627	909	1,105
Total	86	284	323	390	540	895	1,301	1,613

Sources: Economic Statistics Yearbook 1971, The Bank of Korea; Statistics Yearbook of Transportation, 1972, MOT

February 1973

KOREA

FIRST PORT PROJECT

Busan

Existing Berthage Space Available

A. Deep Water Berthage

Name and Type of of Structure		Length (m)	Available Depth (m)	Use	Condition
Pier No. 1					
Open pier w/fill between aprons	South:	299.0	7.5	Fishery	Deck & Substructure need repair
	North:	407.3	8.0	Public	
Pier No. 2					
Open pier w/fill between aprons	South:	388.5	8.0	Public	Deck & Substructure need repair
	North:	419.5	10.2		
Pier No. 3					
South: Caisson gravity	South:	450.0	9.0	Military	Deck needs repairs
North: Stone block gravity	North:	470.0	9.0	Military	
Pier No. 4					
South: Stone block gravity	South:	550.0	9.0	Public	Deck needs repairs
North: Caisson gravity	North:	603.0	9.0		
Central Wharf					
Caisson & stone block gravity		480.0 190.0	9.0	Public	Deck needs repairs
Pukbin Wharf					
Steel sheet pile bulkhead		181.2	6.0	Military	Fair
		4,437.0		Public	
Less No. 1 South		299.0			
		4,138.0			

B. Lighterage Berths

		Length (m)	Available depth (m)	Use	Condition
L/W 1					
Upper:	Stone masonry	160.0	2.0	Public	Deck needs repairs
Lower:	Rubble stone				
L/W 2					
Upper:	Stone masonry	78.0	2.0	Public &	Deck needs reapirs
Lower:	Rubble stone	115.0	2.0	Military	
L/W 3					
Upper:	Stone block	227.0	2.0	Military	Fair
Lower:	Rubble stone	64.0	2.0		
L/W 4					
Upper:	Stone block	362.0	2.0	Public	Deck needs repairs
Lower:	Rubble stone				
L/W 5					
Upper:	Stone block	298.0	2.0	Coal Corpo-	Deck needs repairs
Lower:	Rubble stone			ration	
L/W 6					
Upper:	Stone block	98.0	2.0	Coal Corpo-	Deck needs repairs
Lower:	Rubble stone			ration	
L/W 7					
Counterfoot concrete wall on concrete piles		290.0	2.0	Public	Deck needs repairs
L/W 8					
Upper:	Stone masonry	362.0	2.0	KNR	Fair
Lower:	Rubble stone	502.0	2.0	Military	
Custom's L/W					
Upper:	Stone masonry	192.0	2.0	Customs	Good
Lower:	Rubble stone				
Pukbin L/W					
Upper:	Stone masonry	192.0	2.0	Military &	Deck needs repairs
Lower:	Rubble stone			Passenger	
South Harbor Wharf					
Solid concrete block masonry with portion of marginal wharf		716.0	2.0 7.0		New

TABLE 3

KOREA

FIRST PORT PROJECT

Busan

Forklift Trucks

	Gasoline Engine	Diesel Engine	Electric	Total
1 Ton	5	1		6
2 Ton	18	8		26
3 Ton	18	24	3	45
4 Ton		2		2
5 Ton	14	5		19
6 Ton	7	3		10
7 Ton	11	10		21
8 Ton	3			3
9 Ton	1			1
10 Ton		1		1
15 Ton		1		1
Total				135

Privately Owned Cranes

	Truck	Wheel	Crawl	Rail	Floating	Total
3 Ton				2		2
5 Ton			1			1
10 Ton	4					4
15 Ton	9	2				11
20 Ton	16	1	2			19
25 Ton	4					4
30 Ton	2					2
40 Ton	3				1	4
60 Ton					1	1
Total						48

TABLE 4

KOREA

FIRST PORT PROJECT

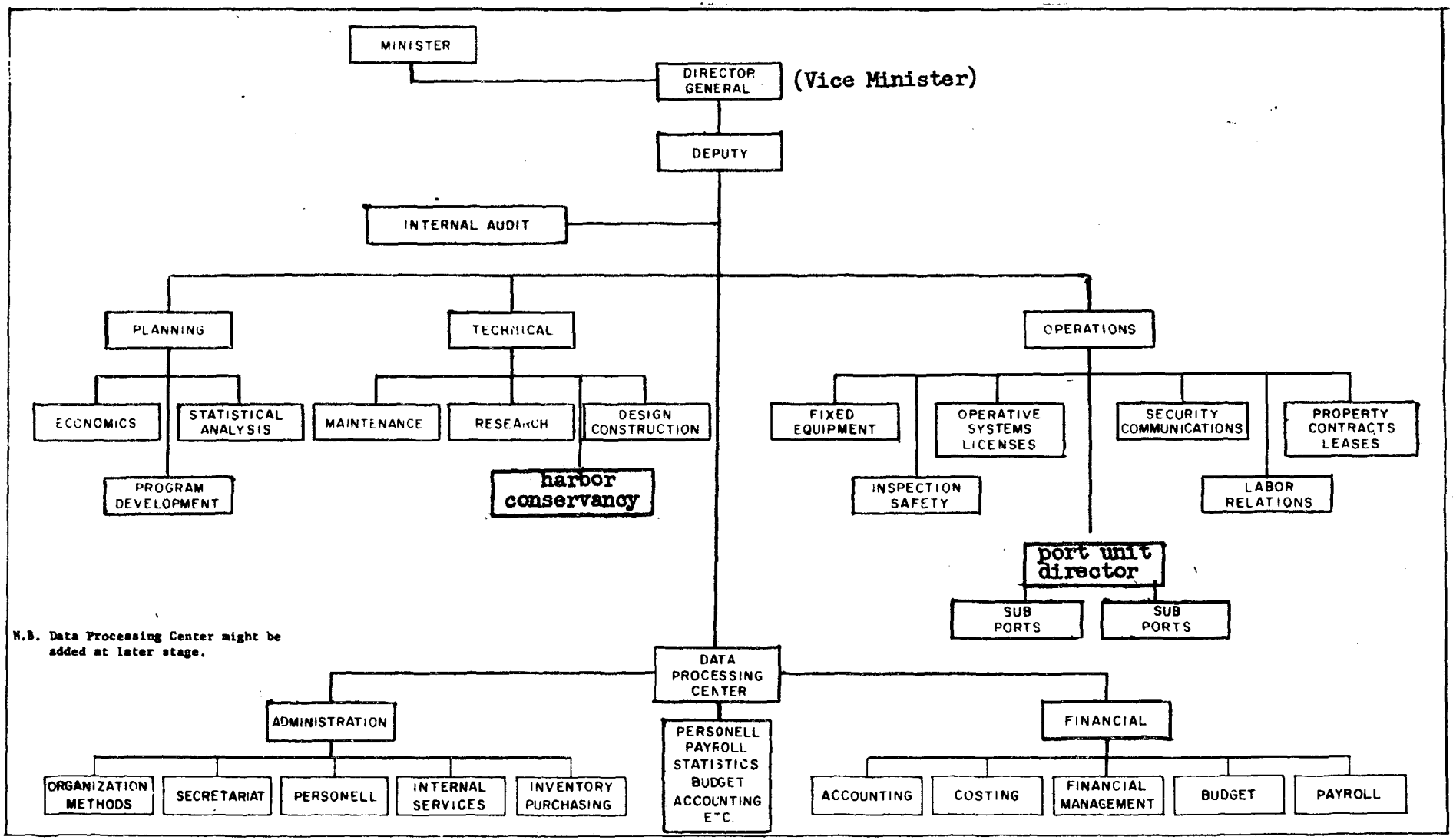
List of First Class Ports

1. Busan
2. Mukho
3. Inchon
4. Kunsan
5. Masan
6. Ulsan
7. Janghand
8. Mokpo
9. Yosu
10. Jeju
11. Soguipo
12. Samchonpo
13. Chungmu
14. Changsungpo
15. Chinhae
16. Pohang
17. Sokcho

KOREA

FIRST PORT PROJECT

Proposed Organization KPA



October 30, 1972

TABLE 5

KOREA

FIRST PORT PROJECT

Individual Port Unit Proposed Organization

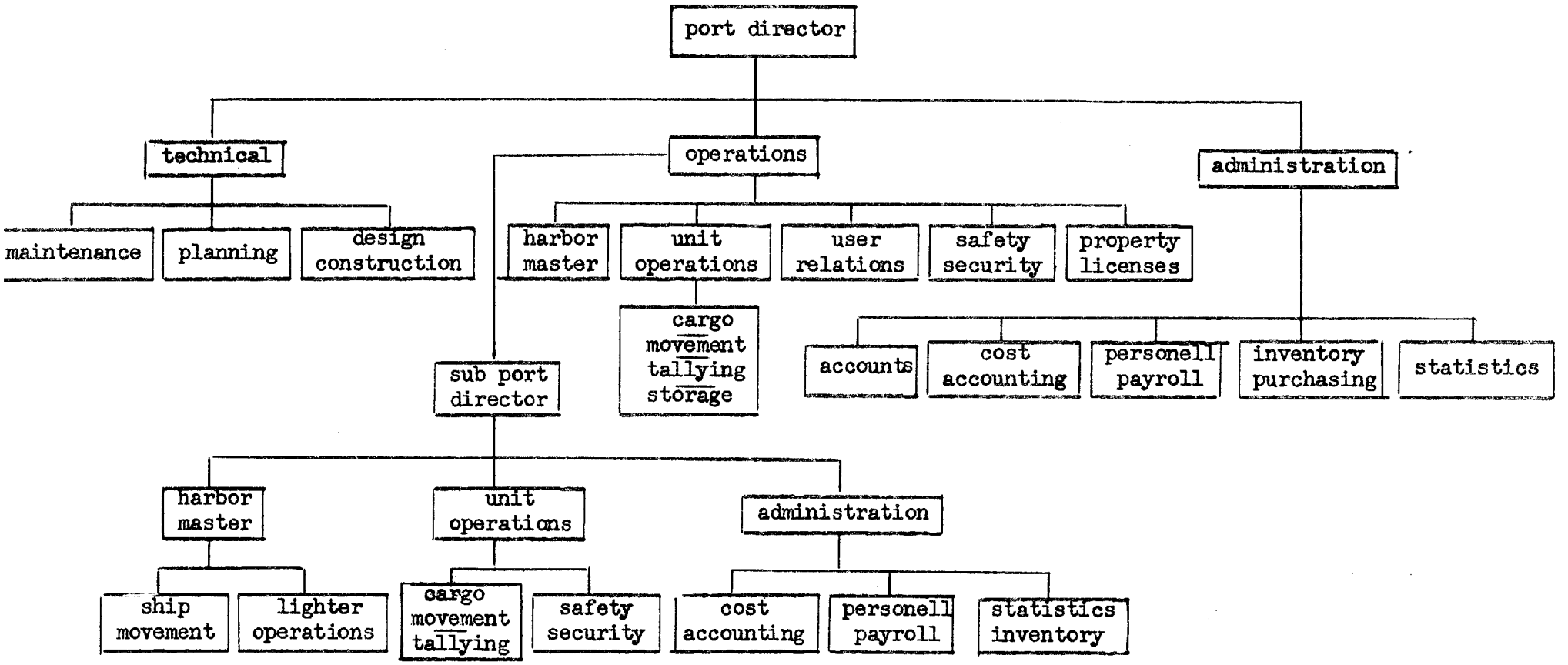


TABLE 6

KOREA

FIRST PORT PROJECT

Government's Port Investment Plan (1972-1976)
with Comparison with Study Group Proposals

(Million Won)

	Port	Study Group	Government	Remarks
1.	Incheon 1/ 3/	7,898	9,313	incl. 13 sheds and grain wharf
2.	Janghand	217	317	incl. maintenance dredging
3.	Kunsan 1/	293	4,869	requested modification as a result of feasibility study
4.	Mokpo	2,482	2,482	
5.	Yosu	147	167	
6.	Jeju	3,360	2,360	excl. raising of breakwater
7.	Samchonpo	-	20	
8.	Chungmu	-	70	maintenance and repair
9.	Masan 1/	3,888	2,650	
10.	Busan 1/	45,767	45,767 2/	
11.	Ulsan 1/	2,026	1,868	
12.	New Pohang	-	10,585	supporting facilities for iron and steel mill with capacity of 2.8 million tons per year
13.	Samchok	2,212	949	
14.	Mukho 1/	3,807	3,807 2/	
15.	Sokcho	-	215	maintenance and repair and expansion of channel
16.	Seokipo	-	110	improve facilities
17.	Changsungpo	-	25	maintanance and repair
18.	Other	-	5,834	maintenance and repair and improve some facilities, including Mipo and fishery section of Ulsan port
	TOTAL	72,097	91,408	

1/ Proposed scheduled port
2/ Estimated costs of these items have been reduced following Bank appraisal mission review
3/ Asia Development Bank to finance a project of Won (equivalent) 10,156 million.

KOREA

FIRST PORT PROJECT

BUSAN AND MUKHO

Detailed Cost Estimate

		US$'000 Foreign Exchange	Won million Local Currency
A.	CIVIL WORKS (BUSAN)		
i)	Dredging in entrance channel, and approaches to Composite Pier and new Pier 7 - 8.4 million m^3 to give 13.5 m in the channel 12.5 m along side container berth and 10 m along side Pier 7	8,240	950
ii)	Composite pier for containers and bulk grain handling 315,000 sq.m. with 600 m container ship berth	19,220	3,740
iii)	Grain silos on Composite pier 70,000 ton capacity	2,750	360
iv)	Pier 7 for bulk coal, chemical and scrap steel handling, 110,000 sq.m.	5,620	1,930
v)	Two new piers 135 m x 50 m for coastal ferries including terminal buildings	770	300
vi)	Pier 1 rebuild N & S sides including transit sheds; international ferry terminal; roll-on/roll-off ramp	5,170	1,520
vii)	Rehabilitate Pier 2; surfacing, transit sheds and utilities	840	270
		42,610	9,070
	MUKHO		
viii)	Dredging in harbor and along side coal pier to give 8.0 m available depth 29,000 m^3	50	5
ix)	Rehabilitate existing coal pier approaches and provide two new loading piers	640	550
x)	Raise existing breakwater crest level over approx. 490 lin m and strengthen side slopes	970	275
xi)	Rehabilitate paving of central wharf and cement loading wharf	240	80
	Sub-Total Civil Works	1,900	910
B.	MECHANICAL EQUIPMENT (BUSAN)		
i)	Container Handling (Composite Pier)		
	4 - 40 t cranes	2,800	220
	7 - 30 t transtainers	1,780	82
	16 - tractors and trailers	580	3
	3 - 20 t fork lifts	300	-
ii)	Bulk coal handling (Pier 7)		
	2 - 300 tons/hour grab cranes	1,450	39
	1 - 600 tons/hour stacker, reclaimer	1,250	59
iii)	Bulk grain handling equipment (Composite Pier)	1,300	4
	2 - 400 tons/hour grain unloaders	350	14
	Silo equipment		
iv)	Bulk scrap steel unloading (Pier 7)		
	2 - 12 ton at 25 m radius cranes	850	55
v)	Roll-on/roll-off ramp height adjusting mechanism Pier 1	350	13
vi)	Bulk ore loading equipment conveyors (Pier 7)	600	44
		11,610	530
	MUKHO		
vii)	Bulk coal loading equipment		
	2 - reclaimers (one 600 tons/hour; one 300 tons/hour)	1,650	92
	3 - 300 tons/hour loaders	1,350	44
	Rehabilitate existing conveyors	100	11
	Sub-Total Mechanical Equipment	3,100	150
C.	CONSULTING SERVICES		
i)	Final design, specification and inspection	2,900	310
ii)	Supervision	2,000	230
iii)	Development study stage II	800	75
iv)	Assistance in forming Port Authority	1,200	65
	Sub-Total Consulting Services	6,900	680
D. (1)	PHYSICAL CONTINGENCIES		
	Civil works (15%)	7,220	1,630
(2)	COST CONTINGENCIES		
	Based on 12½% Foreign Exchange 22½% Local Currency	6,660	2,450
	Sub-Total Contingencies	13,880	4,080
	T O T A L S	80,000	15,420
	Military Pier	-	5,000
	GRAND TOTAL	80,000	20,420
	Won Equivalent	32,000	20,420

KOREA

FIRST PORT PROJECT

Proposed Grouping of Civil Engineering Contracts and Mechanical Equipment Procurement Contracts

1. Civil Engineering Contracts

   A. Dredging

   B. Pier 7)
) Separate Contracts Bidders to quote any reduction
   C. Composite Pier) offered if both contracts awarded

   D. Pier 1, International Ferry, and Coastal Ferry

   E. Pier 2

   F. Mukho Civil Works

2. Mechanical Procurement Contracts

   A. Container cranes and special mechanical equipment 1/

   B. 2 Coal unloaders (Busan)
   2 Granes for scrap

   C. Coal and ores stackers, reclaimers, and conveyors (Busan and Mukho)

   D. Ro-Ro ramp height adjusting equipment

   E. Coal loaders at Mukho

3. Civil Contact with Mechanical Equipment Sub-Contract

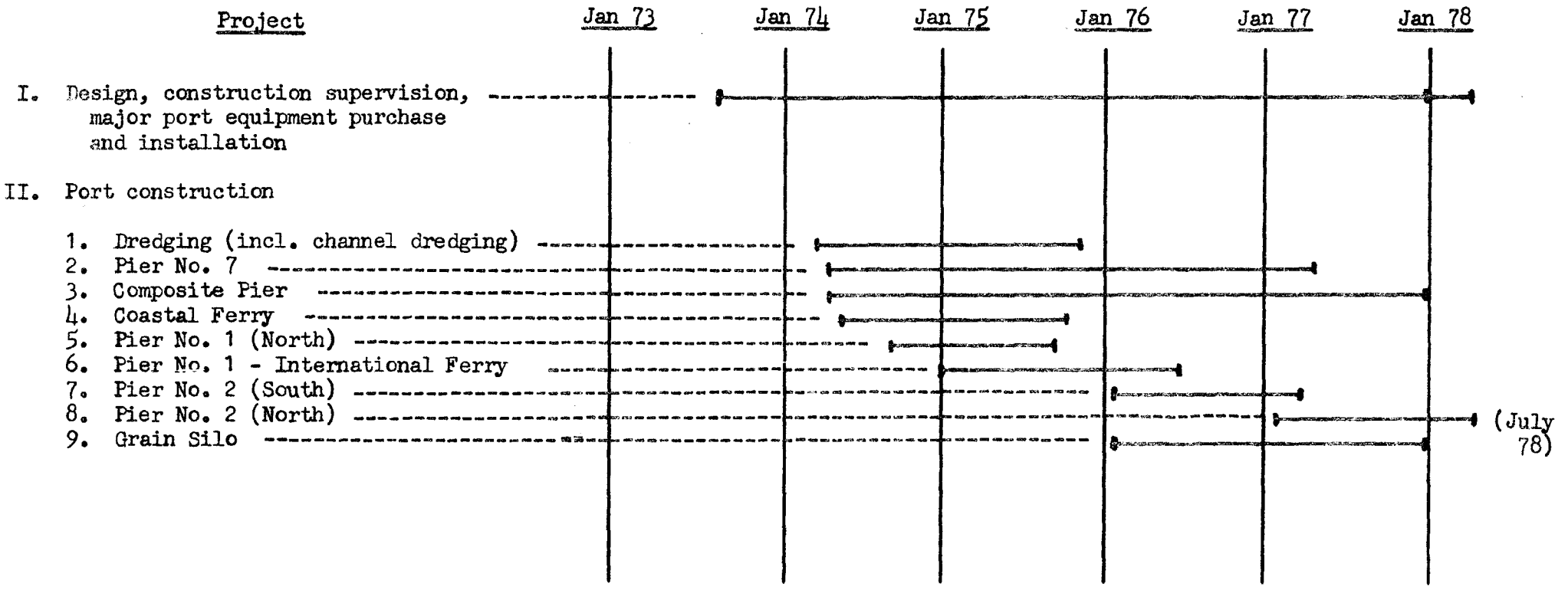
   A. Grain silos, with loading and handling equipment - Busan

1/ This contract will be based on the equipment described in the project but bidders will be allowed to propose alternative methods of handling containers in the stacking area.

KOREA

FIRST PORT PROJECT

Busan - Design and Construction Schedule



May 8, 1973

TABLE 10

KOREA

FIRST PORT PROJECT

Mukho - Design and Construction Schedule

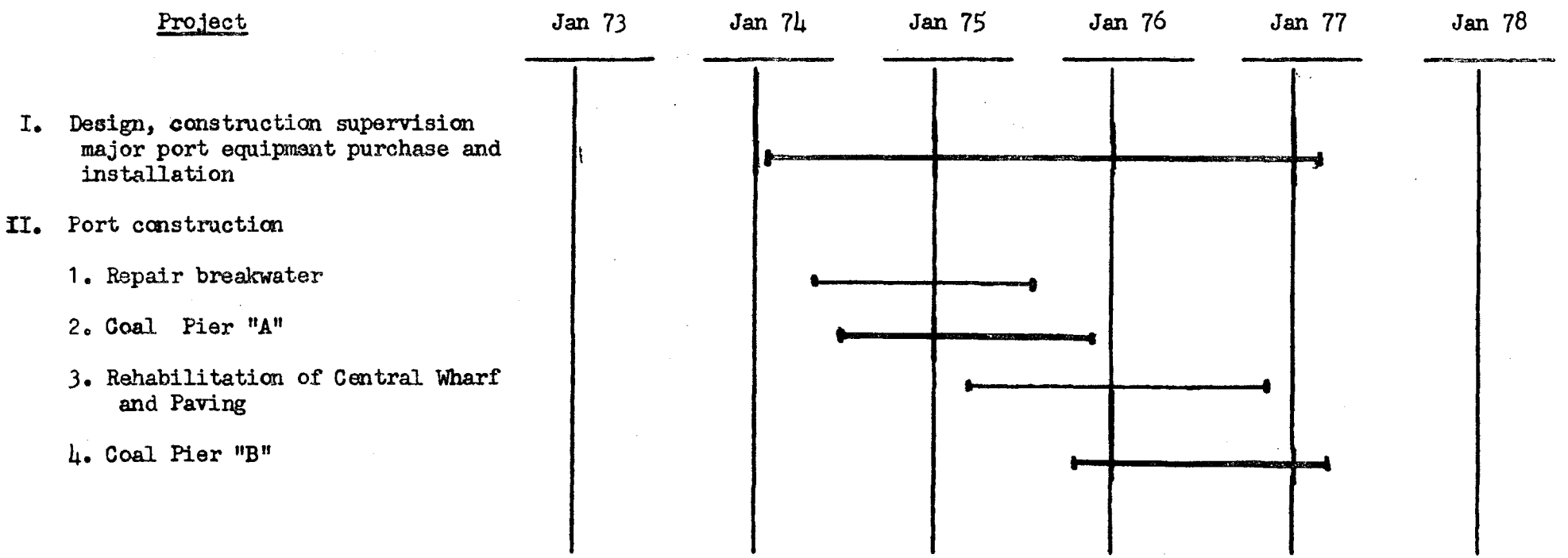


TABLE 11

TABLE 12

KOREA

FIRST PORT PROJECT

Estimated Project Expenditure

Year Ending Dec 31	Expenditure in Foreign Currency (US$'000)	Expenditure in Local Currency (Won million)	
		Bank Project	Military Wharf
1973	500	-	-
1974	11,000	2,620	250
1975	21,100	3,970	750
1976	20,150	3,775	1,600
1977	18,650	3,445	1,250
1978	8,450	1,595	1,000
1979	150	15	150
TOTAL	80,000	15,420	5,000

TABLE T3

KOREA

FIRST PORT PROJECT

Estimated Disbursement Schedule

(US$'000)

Bank Fiscal Year	Quarter	Amount Disbursed	Cumulative Annual	Cumulative Total
74	3	500		
	4	1,000	1,500	1,500
75	1	3,000		
	2	3,850		
	3	4,000		
	4	4,750	15,600	17,100
76	1	5,000		
	2	5,400		
	3	5,400		
	4	5,050	20,850	37,950
77	1	5,000		
	2	5,000		
	3	4,950		
	4	4,800	19,750	57,700
78	1	4,850		
	2	4,750		
	3	3,750		
	4	3,000	16,350	74,050
79	1	2,000		
	2	1,700		
	3	1,500		
	4	750	5,950	80,000

KOREA

FIRST PORT PROJECT

Number and Gross Registered Tonnage (GRT) of Vessels Calling at Mukho and Busan Ports, and Total for All Ports 1962 - 71

Year	Busan								Mukho								All Ports							
	No. of Vessels, Thousand			GRT Total, Million			GRT Per Vessel, Thousand		No. of Vessels, Thousand			GRT Total, Million			GRT Per Vessel, Thousand		No. of Vessels, Thousand			GRT Total, Million			GRT Per Vessel, Thousand	
	Ocean	Coastal	Total	Ocean	Coastal	Total	Ocean	Coastal	Ocean	Coastal	Total	Ocean	Coastal	Total	Ocean	Coastal	Ocean	Coastal	Total	Ocean	Coastal	Total	Ocean	Coastal
1962	1.91	16.58	18.49	6.24	1.32	7.56	3.27	0.08	0.23	4.88	5.11	0.33	0.82	1.15	1.43	0.17	3.80	48.74	54.54	11.31	3.59	14.90	3.00	0.07
63	2.08	18.20	20.28	7.30	1.49	8.79			0.27	5.18	5.45	0.42	0.94	1.36			4.22	61.78	66.00	12.69	4.62	17.31		
64	1.86	16.35	18.21	6.43	1.56	7.99			0.25	4.73	4.98	0.38	0.88	1.26			4.36	67.43	71.79	12.00	5.20	17.20		
65	2.27	18.48	20.75	6.48	2.04	8.52			0.24	5.66	5.90	0.35	0.97	1.32			5.08	72.37	77.45	12.87	6.26	19.13		
66	2.79	16.00	18.80	8.16	2.19	10.35			0.18	2.56	2.74	0.29	0.85	1.14			5.62	64.47	70.09	15.72	5.88	21.60		
67	2.97	16.53	19.50	10.58	1.91	12.49	3.50	0.09	0.15	2.41	2.56	0.36	1.04	1.40	2.40	0.43	6.22	65.98	72.20	19.98	6.81	26.79	3.20	0.10
68	3.61	17.79	21.39	12.60	2.03	14.63			0.18	2.11	2.29	0.38	1.16	1.54			7.35	71.70	79.05	25.65	8.27	33.92		
69	3.64	16.58	20.22	13.29	2.83	16.12			0.22	2.62	2.84	0.49	1.46	1.95			7.47	80.63	88.11	28.76	12.21	40.97		
70	3.72	15.68	19.40	13.97	3.43	17.40			0.23	2.96	3.19	0.35	1.85	2.20			8.13	68.93	77.06	29.97	13.93	43.89		
71	4.45	14.82	19.27	15.27	3.83	19.10	3.45	0.26	0.31	2.54	2.85	0.61	1.88	2.49	1.97	0.74	10.10	65.59	75.69	33.88	16.16	50.04	3.00	0.25

Source: Statistics Yearbook of Transportation, MOT, 1972

Note: The statistics are based on number of inbound vessels

February 1973

TABLE 14

KOREA

FIRST PORT PROJECT

Ocean and Coastal Freight Traffic 1967-71, Busan and Mukho Ports

(Thousand Tons)

Commodity	Busan					Mukho				
	1967	1968	1969	1970	1971	1967	1968	1969	1970	1971
OUTBOUND										
Liquid Bulk										
POL	138	117	171	119	110	6	6	6	1	2
Dry Bulk										
Grain	14	21	24	14	11	3	4	4	2	9
Fertilizers	17	11	6	41	-	5	3	2	-	-
Cement	30	5	5	74	323	1	46	797	1,117	1,476
Coal	14	5	11	7	3	1,553	1,116	1,146	1,645	1,471
Timber	20	31	78	73	5	1	2	4	2	1
Iron Ore	620	411	373	202	142	21	9	1	7	4
Other Ores		241	257	215	205	-	-	6	-	2
Salt	1	1	6	2	2	1	-	-	-	-
Subtotal	716	726	760	628	691	1,525	1,181	1,960	2,773	2,963
General Cargo										
Marine Products	6	-	3	-	1	3	1	-	-	2
Iresh Fish	2	1	1	3	7	2	-	-	-	-
Machinery	-	3	5	7	1	-	1	-	-	-
Scrap Iron	-	10	9	60	86	-	-	1	-	-
Others	683	775	919	1,095	1,370	10	7	9	11	7
Subtotal	691	789	937	1,165	1,465	15	9	10	11	9
TOTAL	1,545	1,632	1,868	1,912	2,226	1,606	1,196	1,976	2,785	2,974
INBOUND										
Liquid Bulk										
POL	1,225	1,132	1,282	1,935	2,317	37	31	120	103	171
Dry Bulk										
Grain	464	593	767	656	1,111	3	3	15	21	34
Fertilizers	168	126	29	6	8	17	15	3	-	-
Cement	267	255	417	523	599	15	1	-	-	-
Coal	687	535	610	893	823	3	21	-	-	-
Timber	623	813	918	1,162	1,312	1	6	2	-	-
Iron Ore	94	2	1	-	-	12	4	6	7	16
Other Ores	-	31	63	78	90	-	-	-	15	16
Salt	24	34	41	5	111	1	2	-	-	-
Subtotal	2,327	2,389	2,846	3,323	4,054	52	52	26	43	66
General Cargo										
Marine Products	2	2	2	1	-	1	1	-	-	2
Fresh Fish	62	78	63	70	81	-	-	1	1	3
Machinery	-	101	202	98	65	-	34	17	2	10
Scrap Iron	-	338	663	21	596	-	1	1	1	-
Others	1,316	1,382	1,249	228	1,522	-	29	54	22	94
Subtotal	1,380	1,901	2,179	418	2,264	1	65	73	26	109
TOTAL	4,932	5,422	6,307	5,676	8,636	90	148	219	172	346

TABLE 15

Source: Ministry of Transportation (MOT).

February 1973

TABLE 16

KOREA

FIRST PORT PROJECT

Passenger Traffic 1967-71, and Projections for 1972-86,
Busan Port and Total for all Ports

Year	All Ports, Thousand Passenger		Busan Thousand Passenger	
	International	Coastal	International	Coastal
1967	12.6	6,700.4	12.6	1,373.0
1968	12.1	6,548.7	12.1	1,500.4
1969	13.0	6,075.6	13.0	1,583.7
1970	24.2	5,869.1	24.2	1,751.7
1971	38.0	6,370.5	38.0	2,009.5
1972	48.0	6,500.0	48.0	2,050.0
1976	70.0	7,050.0	70.0	2,400.0
1981	115.0	7,750.0	115.0	2,900.0
1986	185.0	8,600.0	185.0	3,550.0

Source: MOT and Mission Estimates

February 1973

KOREA

FIRST PORT PROJECT

Forecasts of Freight Traffic Busan Port
(Thousand Metric Tons)

Commodity or Commodity Group	Year																									
	1970 (Actual)					1972					1976					1981					1986				
	Ocean		Coastal		Total	Ocean		Coastal		Total	Ocean		Coastal		Total	Ocean		Coastal		Total	Ocean		Coastal		Total
	In	Out	In	Out		In	Out	In	Out		In	Out	In	Out		In	Out	In	Out		In	Out	In	Out	
Cement	-	172	523	13	708	-	150	850	-	1000	-	200	1200	-	1400	-	250	1750	-	2000	-	300	2500	-	2800
Coal	29	32	863	5	929	50	-	950	-	1000	100	-	1150	-	1250	150	-	1450	-	1600	200	-	1450	-	1650
Ores/Minerals	60	655	31	13	759	100	550	-	-	650	100	600	-	-	700	125	675	-	-	800	160	750	-	-	910
Scrap Metals	588	58	2	2	650	650	-	-	-	650	550	-	-	-	550	470	-	-	-	470	470	-	-	-	470
Steel	-	-	-	-	-	420	-	-	-	420	420	-	350	-	770	240	-	680	-	920	240	-	680	-	920
Grain	645	1	11	13	670	1000	-	-	-	1000	1250	-	-	-	1250	1600	-	-	-	1600	2000	-	-	-	2000
Timber	1152	-	11	11	1174	1600	-	-	-	1600	2000	-	-	-	2000	2500	-	-	-	2500	3200	-	-	-	3200
Plywood	-	221		-	221	-	250		-	250	-	300		-	300	-	320		-	320	-	335		-	335
Pulp	139	-	-	-	139	150	-	-	-	150	100	-	-	-	100	100	-	-	-	100	130	-	-	-	130
Fertilizers	5	7	-	47	-	-	-	5	-	5	-	-	10	-	10	-	-	10	-	10	-	-	10	-	10
Fertilizer Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Containerized General Cargo	10	5	-	-	15	100	175	-	-	275	550	550	-	-	1100	1000	1435	-	-	2435	1400	2385	-	-	3785
Other General Cargo	1299	333	125	118	1875	1165	375	175	175	1890	495	580	175	175	1425	275	570	175	175	1195	215	500	175	175	1065
Total Dry Cargo	3927	1705	1345	210	7187	5235	1500	1980	175	8890	5565	2230	2885	175	10855	6460	3250	4065	175	13950	8015	4270	4815	175	17275
Oil	229	13	1701	106	2047					2460					4330					7630					12050
Total Cargo	4156	1718	3046	316	9236					11350					15185					21580	9265				29675

January 16, 1973

Source: Study Group and Mission Estimates

TABLE 17

KOREA

FIRST PORT PROJECT

Forecasts of Freight Traffic, Mukho Port
(Thousand Metric Tons)

Commodity or Commodity Group	Year																									
	1970 (Actual)					1972					1976					1981					1986				
	Ocean		Coastal		Total	Ocean		Coastal		Total	Ocean		Coastal		Total	Ocean		Coastal		Total	Ocean		Coastal		Total
	In	Out	In	Out		In	Out	In	Out		In	Out	In	Out		In	Out	In	Out		In	Out	In	Out	
Cement/Clinker	-	181	-	936	1117	-	1000	-	1150	2150	-	1550	-	1550	3100	-	2300	-	2100	4400	-	3250	-	2750	6000
Coal	-	306	-	1339	1645	-	300	-	1500	1800	-	300	-	1800	2100	-	300	-	2200	2500	-	300	-	2200	2500
Ores/Minerals	14	6	9	1	30	40	-	60	-	100	60	-	90	265	415	110	-	140	565	815	135	-	165	565	865
Scrap Metals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Timber	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plywood	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pulp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fertilizers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fertilizer Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Containerized General Cargo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other General Cargo	6	-	19	11	36	10	5	30	15	60	10	5	40	15	70	15	5	40	15	75	15	10	40	15	80
Total Dry Cargo	32	493	38	2291	2854	60	1305	90	2665	4120	75	1855	130	3630	5690	135	2605	180	4880	7800	160	3560	205	5530	9455
Oil	-	-	103	1	104	-	-	300	-	300	-	-	600	-	600	-	-	1000	-	1000	-	-	1500	-	1500
Total Cargo	32	493	103	2292	2958	60	1305	390	2665	4420	75	1855	730	3630	6290	135	2605	1180	4880	8800	160	3560	1705	5530	10955

January 16, 1973

Source: Study Group and Mission Estimates

TABLE 18

KOREA

FIRST PORT PROJECT

Freight Traffic Forecast by Type of Cargo, Busan Port
(Thousand Metric Tons)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Cumulative Total 1973-81
I. Cargo on General Cargo Berths											
A. Ocean In											
Bulk											
Grain	1,000	1,060	1,120	1,180	1,250	1,300	-	-	-	-	5,910
Ores & Minerals	100	100	100	100	100	-	-	-	-	-	400
Coal	50	60	70	85	100	-	-	-	-	-	315
Total	1,150	1,220	1,290	1,365	1,450	1,300	-	-	-	-	6,625
Others											
Pulp	150	140	130	115	100	100	100	100	100	100	985
Timber	67	72	77	82	87	88	90	91	92	94	773
Scrap	650	625	600	575	550	-	-	-	-	-	2,350
Steel	420	420	420	420	420	385	350	315	280	240	3,250
Break Bulk	1,145	990	830	670	495	450	405	360	315	275	4,790
Total	2,432	2,247	2,057	1,862	1,652	1,023	945	866	797	709	12,148
B. Ocean Out											
Bulk											
Ores & Minerals	550	560	570	585	600	-	-	-	-	-	2,315
Cement	150	160	170	185	200	210	220	230	240	250	1,865
Others											
Plywood	250	261	274	287	300	300	300	300	300	300	2,622
Break Bulk	375	425	475	525	580	565	550	535	520	500	4,675
Total	1,325	1,406	1,489	1,582	1,680	1,075	1,070	1,065	1,060	1,050	11,477
C. Containerized Ocean											
Number of Containers (000's)											
Inward Full	3	7	12	16	20	30	-	-	-	-	88
Inward Empty	3	3	2	1	-	8	-	-	-	-	17
Outward Full	6	10	14	17	20	38	-	-	-	-	105
Total	12	20	28	34	40	76					
Cargo in Revenue Tons											
Inward	30	80	130	180	240	340	-	-	-	-	970
Outward	70	110	150	190	240	419	-	-	-	-	1,109
Total	100	190	280	370	480	759	-	-	-	-	2,079

Source: Study Group and Mission Estimates

TABLE 19
Page 1

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Cumulative Total 1973-81
D. Coastal											
Bulk											
Coal	950	1,000	1,050	1,100	1,150	-	-	-	-	-	4,300
Other											
Steel	-	50	175	175	350	-	-	-	-	-	750
Break Bulk	350	350	350	350	350	350	350	350	350	350	3,150
Total	1,300	1,400	1,575	1,625	1,850	350	350	350	350	350	8,200
Bulk											
Cement	850	920	1,000	1,100	1,200	1,300	1,400	1,500	1,625	1,750	11,795
E. Total Freight, (Subject to Wharfage) Thousand Metric Tons	7,157	7,383	7,691	7,904	8,310	5,803	3,765	3,781	3,832	3,859	52,328

C. Cargo on Special Berths

A. International Ferry Berth

Containerized											
Inward Cargo	70	130	190	250	310	310	310	310	310	310	2,430
Outward Cargo	105	150	200	260	310	310	310	310	310	310	2,470
Total	175	280	390	510	620	620	620	620	620	620	4,900
Container Numbers (000's)											
Inward	6	12	17	23	28	28	28	28	28	28	220
Outward	9	14	18	24	28	28	28	28	28	28	224
Total	15	26	37	47	56	56	56	56	56	56	444

	1973	1974	1975	1976	1977	1978	1979	1980	1981	Cumulative Total 1973-81
B. Composite Pier										
Containerised										
Inward Cargo	-	-	-	-	-	428	515	602	690	2,235
Outward Cargo	-	-	-	-	-	592	773	950	1,127	3,444
Total	-	-	-	-	-	1,020	1,284	1,548	1,813	5,679
Container Numbers (000's)										
Inward Full	-	-	-	-	-	39	47	55	62	203
Inward Empty	-	-	-	-	-	15	23	31	40	109
Outward Full	-	-	-	-	-	54	70	86	102	312
Total	-	-	-	-	-	108	140	172	204	624
Bulk Grain	-	-	-	-	-	1,400	1,460	1,530	1,600	5,990
Total	-	-	-	-	-	2,420	2,750	3,080	3,413	11,663
C. Pier No. 7										
Ocean in Coal	-	-	-	-	100	100	120	135	150	505
Coastal Coal	-	-	-	-	1,210	1,270	1,330	1,390	1,450	6,650
Ocean in Ores	-	-	-	-	100	100	110	110	125	545
Ocean Out Ores	-	-	-	-	615	630	645	660	675	3,225
Ocean in Scrap	-	-	-	-	535	520	505	490	470	2,520
Coastal Steel	-	-	-	-	415	480	560	620	680	2,755
Total	-	-	-	-	2,975	3,100	3,270	3,405	3,550	16,200
D. Total Port Facilities	280	390	510	624	3,599	6,144	6,644	7,109	7,587	32,887
III. Timber (Unloaded into Floating Area)	1,628	1,723	1,818	1,913	2,012	2,110	2,209	2,308	2,306	18,027
Total Port Traffic, Inner Port	9,291	9,804	10,232	10,847	11,414	12,019	12,634	13,249	12,752	73,242
IV. Oil	2,875	3,305	3,800	4,330	4,890	5,475	6,135	6,855	7,630	45,295
Total Port Traffic	12,166	13,109	14,032	15,177	16,304	17,494	18,769	20,904	21,382	118,537

KOREA

FIRST PORT PROJECT

Freight Traffic Forecasts by Type of Cargo, Mukho Port

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Cumulative Total 1973-81
I. Freight, Thousand Tons											
A. Ocean In											
Bulk	50	54	58	62	66	76	86	97	107	117	723
Others	10	10	10	10	10	10	12	13	14	15	105
Total	60	64	68	72	76	86	98	110	121	132	828
B. Ocean Out											
Bulk (Mech. Handled Coal)	300	300	300	300	300	300	300	300	300	300	2,700
Bulk (Mech. Handled Cement)	1,000	1,100	1,250	1,400	1,550	1,700	1,850	2,000	2,150	2,300	15,300
Others	5	5	5	5	5	5	5	5	5	5	45
Total	1,305	1,405	1,555	1,705	1,855	2,005	2,155	2,305	2,455	2,605	18,045
C. Coastal											
Bulk (Mech. Handled Coal)	1,500	1,600	1,667	1,733	1,800	1,880	1,960	2,040	2,120	2,200	17,000
Bulk (Mech. Handled Cement)	1,150	1,250	1,350	1,450	1,550	1,650	1,750	1,850	1,950	2,100	14,900
Bulk (Mech. Handled Limestone)	60	66	265	265	265	325	385	445	505	565	3,086
Others	45	132	149	164	180	190	200	210	220	230	1,675
Total	2,755	3,048	3,431	3,612	3,795	4,045	4,295	4,545	4,795	5,095	36,661
TOTAL FREIGHT TONS	4,120	4,518	5,053	5,389	5,656	6,138	6,548	6,960	7,371	7,832	55,684
II. Gross Registered Tonnage ('000 tons)	3,760	4,230	4,700	5,010	5,265	5,710	6,090	6,470	6,850	7,270	51,595

TABLE 20

Source: Study Group and Mission Estimates

January 17, 1973

TABLE 21

KOREA

FIRST PORT PROJECT

Savings in Grain Shipment Costs

Year	Costs per ton handled, US $						Savings, US $		Volume of Grain, million Tons	Total Benefits to Project, US$ Million
	Present System			With Project			Total	To Project		
	Handling	Vessel in Port	Sea Voyage	Handling	Vessel in Port	Sea Voyage				
		1/						2/		
1977	1.22	3.07	7.26	0.20	0.47	6.45	4.43	2.73	1.30	3.55
78		3,38					4,74	3.04	1.40	4.26
79		3.72					5.12	3.38	1.46	4.93
80		4.09					5.49	3.75	1.53	5.74
81		4.50					5.90	4.15	1.60	6.64
82		4.95					6.35	4.61	1.68	7.74
83		5.45					6.85	5.11	1.76	8.99
84		6.00					7.40	5.66	1.84	10.41
85		6.60					8.00	6.26	1.92	12.02
86-96		7.25					8.65	6.91	2.00	13.82

Note: 1/ The cost for vessel in port will increase annually by 10% due to increased waiting time.

2/ The annual increase in costs for vessel in port after 1977 have been fully allocated the project.

TABLE 22

KOREA

FIRST PORT PROJECT

Savings in Transport Cost of General Cargo after Containerization

Year	Cost per ton, US $						Savings, US $ per Ton		Containerized Cargo, Million Tons	Total Project Benefits US $ Million
	Conventional Ships			Container Vessels						
	Handling	Vessel in Port	Sea Voyage	Handling	Vessel in Port	Sea Voyage	Total	To Project		
1977	1.92	10.18 1/	12.84	0.22	2.08	13.90	8.74	6.40 2/ 3/	0.76	4.86 4/
78		11.20					9.76	7.42	1.02	7.57
79		12.32					10.88	8.54	1.29	11.01
80		13.551					12.11	9.77	1.55	15.14
81		14.90					13.46	11.12	1.82	20.24
82		16.40					14.96	12.62	2.20	27.76
83		18.05					16.61	14.27	2.58	35.82
84		19.85					18.41	16.07	2.98	47.89
85		20.85					20.41	18.07	3.38	61.08
86-96		22.95					22.51	20.17	3.78	76.24

Note: 1/ The cost for vessel in port will increase annually by 10% due to increased waiting times.

2/ The increased cost annually for vessel in port after 1977 has been fully allocated to the project.

3/ 2/3 of the savings in ship costs in 1977 allocated to the project, as 1/3 of general cargo shipped under Korean flag.

4/ No increase in benefits has been calculated after 1986; in the non-project case maximum handling capacity reached.

TABLE 23

KOREA

FIRST PORT PROJECT

Savings in Coal Shipment Costs

Year	Cost per ton, US $						Benefits to Project US $ per ton	Volume of Coal, Million tons	Total Savings, US $ Million
	Present System			With Project					
	Hand-ling	Vessel in Port	Sea Voyage	Hand-ling	Vessel in Port	Sea Voyage			
1977	1.25	0.88	0.45	0.22	0.42	0.45	1.49	1.31	1.95
78		0.97					1.58	1.37	2.16
79		1.07					1.68	1.45	2.34
80		1.18					1.79	1.52	2.72
81		1.30					1.91	1.60	3.06
82		1.30					1.91	1.60	3.06
83		1.30					1.91	1.60	3.06
84		1.30					1.91	1.60	3.06
85		1.30					1.91	1.60	3.06
86-96		1.30					1.91	1.60	3.06

See note in Table 22; however in this case the total cost reduction is allocated to project, as coal is carried under Korean flag.

TABLE 24

KOREA

FIRST PORT PROJECT

Savings in Transport Costs of

Minerals, Ores, Steel and Scrap

Year	Cost per ton, US $				Savings, US $ per ton		Cargo Volume, Million Tons	Project Benefits, US $ Million
	Present Operations		With Project					
	Handling	Vessel in Port	Handling	Vessel in Port	Total	To Project		
1977	1.25	0.80	0.46	0.37	1.22	1.03	1.67 1/	1.72
78		0.88				1.11	1.73	1.92
79		0.97				1.20	1.82	2.18
80		1.07				1.30	1.88	2.44
81		1.18				1.41	1.95	2.75
82		1.30				1.53	1.97	3.01
83		1.43				1.66	1.99	3.30
84		1.57				1.80	2.01	3.62
85		1.73				1.96	2.03	3.98
86-96		1.80				2.13	2.06	4.39

Note: The project will not effect the sea voyage costs of these commodities. For other notes see Table 22.

1/ Some steel will, after completion of Pier 7, still be imported as general cargo. This volume, which amounts to 0.38 million tons in 1977, will gradually decrease to 0.24 million tons by 1981.

TABLE 25

KOREA

FIRST PORT PROJECT

Savings in Transport Costs of Containers,

International Ferry Terminal

Year	Cost per ton, US $						Savings, US $ per Ton		Containerized Cargo, Million Tons	Total Project Benefits US $ Million
	Conventional			Ro-ro Ferry						
	Handling	Vessel in Port	Sea Voyage	Handling	Vessel in Port	Sea Voyage	Total	To Project		
1977	1.92	10.18	2.20	1.20	2.30	2.85	7.95	4.84	0.62	3.00
78		11.20					8.97	5.86	0.62	3.63
79		12.32					9.09	6.98	0.62	4.33
80		13.55					10.32	8.21	0.62	5.09
81		14.90					11.67	9.56	0.62	5.93
82		16.40					13.17	11.06	0.62	6.86
83		18.05					14.82	12.71	0.62	7.88
84		19.85					16.62	14.51	0.62	9.00
85		20.85					18.62	16.51	0.62	10.24
86-96		22.85					20.72	18.61	0.62	11.54

TABLE 26

KOREA

FIRST PORT PROJECT

Economic Return (ER) and First Year Return (FYR) on Project Investment

Year	Busan					Mukho		Total Project	
	Benefits, US $ Million				Costs, US $ Million	Benefits, US $ Million	Costs, US $ Million	Benefits, US $ Million	Costs, US $ Million
	Composite Pier	Pier 7	Ferry Terminal	Total					
1973					0.45				0.45
74					12.39		2.24		14.63
75					23.94		3.24		27.18
76					23.18		2.99		26.17
77	8.41	3.67	3.48	15.56	23.76	1.38	0.35	16.94	24.11
78	11.83	4.08	4.13	20.04	10.42	1.43	0.46	21.47	10.88
79	15.94	4.52	4.85	25.31		1.54		26.85	
80	20.68	5.16	5.64	31.68		1.59		33.27	
81	26.88	5.81	6.61	39.30		1.71		41.01	
82	35.50	6.07	7.48	49.05		1.71		50.76	
83	44.81	6.36	8.52	59.69		1.71		61.40	
84	58.30	6.68	9.65	74.63		1.71		76.34	
85	73.10	7.04	10.92	91.06		1.71		92.77	
86-96	80.06	7.45	12.25	99.76		1.71		101.47	
Total				1503.68	94.14	33.30	9.28	1536.98	103.42

ER = 32.5% with best cost and benefit estimates
ER = 26.7% with 15% overrun in cost and appropriate benefit shippage

First Year Return

Project Component	Cost	Benefit 1977	FYR
	(US$ Million)		%
Busan			
(i) Composite Pier	55.57	8.41	15.1
(ii) Pier 7	23.56	3.67	15.6
(iii) International and Coastal Ferry Terminal	13.16	3.48	26.4
Sub-total Busan	94.14	15.56	16.5
Mukho	9.28	1.38	14.9
Total Project	103.42	16.94	16.4

Note: (1) Benefits exclude cost reductions to be retained by foreign carriers (Tables 21-25).
(2) Costs include construction costs, physical contingencies, and consultants' design and supervision costs, but exclude contingencies for price escalation and estimated cost for technical assistance to KPA and further port studies.
(3) Benefits and costs discounted to base year 1973 over a 24 year period.
(4) Total cost for Busan, US$94.14 million, includes US$1.85 million for rehabilitation of Pier 2; no separate benefits have been calculated for this item.

KOREA

FIRST PORT PROJECT

Summary of Present Port Services, Tariff Responsibility, Revenue Recipient
Approximate Level of Charges and Payer of the Charges

TARIFF OR SERVICE	TARIFF RESPONSIBILITY	REVENUE RECIPIENT	BASIC CHARGES	PAYER
1. Tonnage (Port) Dues	MOF - Customs Dept.	MOF	Nil - Coastal Vessels W 30.00 - per NRT - All others	Vessel
2. Light Dues	MOT - Hydrographic Office	MOT	W 1.00 - per GRT - Coastal 4.00 - per GRT - Others	Vessel
3. Dockage - (Berthing) (at wharf or mooring buoy)	MOT - Marine Bureau	MOT	Per Grt - less than 24 hrs Won 1.20 each 12 hr period More than 24 hrs Won 2.40 each 24 hr period	Vessel
4. Tuggage	MOT - Marine Bureau	MOT or Owner	Sliding scale basis H.P. up to W 25.00 per hour	Vessel
5. Cranage - A) Floating	MOT - Marine Bureau	MOT or Owner	A)From Won 7,000 to 15,000 per hr	Vessel
B) Land			B)From Won 800 to 2,000 per hr	Cargo
6. Use of transit shed for holding cargo	MOT - Marine Bureau	MOT	Up to 5 days W 2.40 per ton day 6 to 15 days 4.80 " " " over 15 days 9.60 " " "	Cargo
7. Use of open areas for holding cargo	MOT - Marine Bureau	MOT	Up to 5 days W 0.60 per ton day 6 to 10 days 1.20 " " " 11 to 15 days 1.50 " " " Over 15 days 2.40 " " "	Cargo
8. Bonded warehouse storage A) MOF operated	MOF - Customs Dept.	A) MOF	A)10 days free time - estimates are first 15-day period - W 57 per ton	Cargo
B) Privately operated		B) Owner	B)W 997 per 15 day period per ton	
C) Open areas		C) Owner	C)W 469 per 15 day period per ton	

TABLE 27

January 30, 1973

TABLE 28

KOREA

FIRST PORT PROJECT

Operating Revenues - First Class Ports, 1967-1972

(Won 000,000)

	1967	1968	1969	1970	1971	Estimated in Part 1972
Operating Revenues						
Tonnage Dues	155.6	196.8	228.6	247.5	282.4	550.0
Light Dues	61.1	79.8	94.5	106.8	120.2	137.8
Tuggage	20.8	53.5	99.4	93.9	106.0	163.2
Dockage	49.7	96.8	135.8	116.3	131.5	153.1
Floating Cranes	12.2	21.0	30.0	18.1	17.3	16.4
Transit Shed Charges	12.6	38.4	52.0	59.1	53.8	67.3
Open Cargo-Areas Charges	17.5	85.8	59.2	105.2	97.6	102.5
Rentals of Facilities	-	-	-	4.2	8.4	8.4
Land Cranes	0.5	1.3	0.7	1.4	0.8	1.5
Water Supply and Sundry Incomes	-	-	0.2	1.2	2.3	1.2
Total Operating Revenues	330.0	573.4	700.4	753.7	820.3	1,201.4

Notes: 1. Revenues are for the 17 first class ports.

2. Rental income includes rental of only those assets included in the asset inventory prepared by the Consultants in 1972.

January 25, 1973

KOREA

FIRST PORT PROJECT

First Class Ports
Revenues, Expenses and Net Income 1971 & 1972

(Won 000,000)

	Actual 1971				Estimated in Part 1972			
	Busan	Mukho	15 Others	Total	Busan	Mukho	15 Others	Total
I. Operating Revenues								
Tonnage Dues	113.0	6.3	163.1	282.4	221.0	12.0	317.0	550.0
Light Dues	46.9	4.5	68.8	120.2	62.7	2.5	72.6	137.8
Tuggage	69.2	17.2	19.6	106.0	110.0	12.6	40.6	163.2
Dockage	82.3	8.5	40.7	131.5	100.0	7.6	45.5	153.1
Floating Crane	11.3	-	6.0	17.3	12.0	-	4.4	16.4
Transit Shed Charges	43.1	1.2	9.5	53.8	55.0	2.2	10.1	67.3
Open Cargo Areas Charges	69.6	2.2	25.8	97.6	55.0	1.8	45.7	102.5
Rentals of Facilities	8.4	-	-	8.4	8.4	-	-	8.4
Land Cranes	-	-	0.8	0.8	-	-	1.5	1.5
Water Supply	-	-	0.4	0.4	-	-	-	-
Sundry Income	1.9	-	-	1.9	1.2	-	-	1.2
Total Operating Revenues	445.7	39.9	334.7	820.3	625.3	38.7	537.4	1,201.4
II. Operating Expenses								
Navigational Aids	4.2	1.0	38.3	43.5	5.2	1.3	48.5	55.0
Maintenance	198.1	7.6	288.8	494.5	65.4	10.6	310.2	386.2
MOT Port Administration	84.1	26.9	139.5	250.5	93.0	23.9	159.4	276.3
MOC Administrative Expenses	9.6	7.6	52.1	69.3	11.2	13.3	67.4	91.9
MOT Headquarters Overhead	4.7	0.6	6.7	12.0	5.5	0.7	7.7	13.9
MOC Headquarters Overhead	2.3	1.3	33.1	36.7	3.0	0.9	36.8	40.7
Depreciation	342.0	137.0	333.0	812.0	332.0	133.0	538.0	1,003.0
Total Operating Expenses	645.0	182.0	891.5	1,718.5	515.3	183.7	1,168.0	1,867.0
III. Net Operating Revenues (Deficit)	(199.3)	(142.1)	(556.8)	(898.2)	110.0	(145.0)	(630.6)	(665.6)
IV. Interest, Other Fixed Charges	-	-	-	-	-	-	-	-
V. Net Income (Loss)	(199.3)	(142.1)	(556.8)	(898.9)	110.0	(145.0)	(630.6)	(665.6)
Ratios								
Operating Ratios	145	456	266	210	82	475	217	155

TABLE 29

January 25, 1973

KOREA

FIRST PORT PROJECT

Port of Busan

Revenues, Expenses and Net Income

Estimated for Years 1972 - 1981

(Won Millions)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
I. OPERATING REVENUES:										
Port Dues	221	230	300	322	408	426	499	520	542	567
Light Dues	63	65	-	-	-	-	-	-	-	-
Dockage	100	110	650	624	604	860	2,639	2,685	2,726	2,791
Service Charge	-	-	-	-	451	389	297	296	298	298
Wharfage	-	-	426	434	902	649	497	495	498	498
Transit Shed Charge	55	60	-	-	-	-	-	-	-	-
Cargo Open Areas Charge	55	60	-	-	-	-	-	-	-	-
Demurrage (Cargo)	-	-	-	-	100	67	55	55	56	57
Concession Fees (Cargo)	-	-	-	112	112	112	112	112	112	112
Rentals -										
Composite Pier	-	-	-	-	-	-	1,500	1,500	1,500	1,500
Pier 7	-	-	-	-	-	800	800	800	800	800
Ferry Piers	-	-	20	50	625	625	625	625	625	625
Other	-	-	-	-						
Miscellaneous Revenue	131	135	135	139	145	153	160	168	176	186
Total Operating Revenues	625	660	1,531	1,681	3,347	4,081	7,184	7,256	7,333	7,434
II. OPERATING EXPENSES:										
Navigation Aids	5	5	5	5	5	5	5	5	5	5
Maintenance Dredging	-	-	-	-	-	70	70	70	70	70
Port Captain Office	-	-	-	-	13	13	14	14	14	14
General Maintenance	76	80	336	338	338	385	557	559	561	563
MOC Allocation	3	4	-	-	-	-	-	-	-	-
Special Services Tugs, etc.	-	-	82	84	86	88	91	93	95	98
Miscellaneous Dock Labor	-	-	-	-	225	230	150	150	150	150
Sundry Dock Expense	-	-	-	25	26	27	27	27	27	27
General and Administrative -										
Headquarters Allocations	6	10	70	86	100	100	100	100	100	100
Regional Office	93	100	125	175	200	225	250	250	250	250
Management - Operations	-	-	-	-	130	160	175	175	175	175
Administration	-	-	-	-	134	160	200	200	200	200
Other	-	-	-	-	50	60	60	60	60	60
Total										
Depreciation	332	410	410	410	594	883	1,646	1,663	1,678	1,738
Total Operating Expenses	515	609	1,028	1,123	1,901	2,406	3,345	3,366	3,385	3,450
III. NET OPERATING REVENUES	110	51	503	558	1,446	1,675	3,839	3,890	3,948	3,984
IV. INTEREST ON DEBT	-	58	314	832	1,508	2,023	2,547	2,726	2,601	2,465
V. NET INCOME (LOSS)	110	(7)	189	(274)	(62)	(348)	1,292	1,164	1,347	1,519
VI. OPERATING RATIO			67	67	57	59	46	46	46	46
VII. TIMES INTEREST EARNED			1.6	0.7	0.9	0.8	1.5	1.4	1.5	1.6
VIII. DEBT SERVICE COVERAGE			2.9	1.2	1.3	1.3	2.1	1.3	1.3	1.3
IX. RATE OF RETURN			4.0	4.6	7.4	4.9	6.1	5.8	6.0	6.1

January 29, 1973

TABLE 30

KOREA

FIRST PORT PROJECT

Port of Busan

Estimated Balance Sheet Data
1973 - 1981
(Won millions)

	1973	1974	1975	1976	1977	1978	1979	1980	1981
A. Assets									
1. Current Assets									
Cash	403	-	110	112	62	107	296	452	805
Accounts Receivable	-	-	-	286	295	303	361	393	437
Stores	-	-	-	100	100	150	150	183	200
Other	-	-	100	25	25	26	27	28	30
Total	403	-	210	523	482	586	834	1,056	1,472
2. Fixed Assets									
Gross Value Land	2,673	2,673	2,673	2,673	6,313	9,124	9,124	9,124	9,124
Gross Value Other	10,949	10,949	10,949	19,063	31,149	58,298	63,798	64,298	66,298
Accumulated Depreciation	742	1,152	1,562	2,156	3,039	4,685	6,348	8,026	9,764
Net Value Other Assets in Use	10,207	9,797	9,387	16,907	28,110	53,613	57,450	56,272	56,534
Total Net Fixed Assets in Use	12,880	12,470	12,060	19,580	34,423	62,737	66,574	65,396	65,658
Work in Progress	671	6,861	18,536	22,707	23,181	4,785	500	1,000	-
Total Fixed Assets	13,551	19,331	30,596	42,287	57,604	67,522	67,074	66,396	65,658
3. Total Assets	13,954	19,331	30,806	42,810	58,086	68,108	67,908	67,452	67,130
B. Liabilities and Equity									
1. Current Liabilities									
Accounts Payable	-	-	-	299	307	315	323	338	350
Other	-	-	-	12	13	14	15	16	17
Total	-	-	-	311	320	329	338	354	367
2. Long-Term Debt									
IBRD Loan	200	3,970	11,495	18,675	26,025	29,185	29,012	28,543	28,039
Other	-	-	-	2,975	6,350	8,100	6,750	5,400	4,050
Total	200	3,970	11,495	21,650	32,375	37,285	35,762	33,943	32,089
3. Equity									
Government Capital	13,754	15,172	19,396	20,996	25,886	29,697	29,847	29,847	29,847
Retained Earnings (Deficits)	-	189	(85)	(147)	(495)	797	1,961	3,308	4,827
Total	13,754	15,361	19,311	20,849	25,391	30,494	31,808	33,155	34,674
4. Total Liabilities and Equity	13,954	19,331	30,806	42,810	58,086	68,108	67,908	67,452	67,130
C. Ratios									
Current		N.A.	N.A.	1.7	1.5	1.8	2.5	3.0	4.0
Liquid		N.A.	N.A.	1.4	1.2	1.3	2.0	2.4	3.5
Debt/Equity		20/80	37/63	51/49	56/44	55/45	55/45	50/50	48/52

Army Pier added to Fixed Assets and Government Capital in 1979.

May 21, 1973

TABLE 31

KOREA

FIRST PORT PROJECT

Port of Busan

Estimated Cash Flow Data

1972 - 1981

(Won millions)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Total 1973-1981	%
I. CASH REQUIREMENTS												
1. Capital Investments												
Project	-	200	5,940	10,925	10,470	10,735	4,755	65	-	-	43,070	
Other	471	-	-	-	215	575	2,998	1,000	1,000	1,000	6,788	
Total Investments	471	200	5,940	10,925	10,685	11,310	7,753	1,065	1,000	1,000	49,878	70.7
2. Debt Service												
IBRD Interest	-	58	314	832	1,508	1,800	2,071	2,119	2,095	2,060	12,857	
IBRD Repayment	-	-	-	-	-	-	-	223	469	504	1,196	
Government Interest	-	-	-	-	-	223	476	607	506	405	2,217	
Government Repayments	-	-	-	-	-	-	-	1,350	1,350	1,350	4,050	
Total	-	58	314	832	1,508	2,023	2,547	4,299	4,420	4,319	20,320	28.8
3. Increase in Working Capital	-	-	-	-	-	-	50	50	50	50	200	0.3
4. Initial Purchase Stores	-	-	-	100	-	-	-	-	-	-	100	0.2
5. Total Cash Required	471	258	6,254	11,857	12,193	13,333	10,350	5,414	5,470	5,369	70,498	100.0
II. CASH AVAILABLE												
1. Internally Generated												
Net Operating Revenue	110	51	503	558	1,446	1,675	3,839	3,890	3,948	3,984	19,894	
Depreciation	332	410	410	410	594	883	1,646	1,663	1,678	1,738	9,432	
Other	-	-	-	-	-	-	-	-	-	-	-	
Total	442	461	913	968	2,040	2,558	5,485	5,553	5,626	5,722	29,326	41.6
2. Government Budget Grant	29	-	1,168	3,474	-	-	-	-	-	-	4,642	6.6
3. Loans:												
Proposed IBRD Loan	-	200	3,770	7,525	7,180	7,350	3,160	50	-	-	29,235	
Government	-	-	-	-	2,975	3,375	1,750	-	-	-	8,100	
Total	-	200	3,770	7,525	10,155	10,725	4,910	50	-	-	37,335	52.9
4. Cash - Beginning of Year	-	-0-	403	-0-	110	112	62	107	296	452	-	
5. Total Cash Available	471	661	6,254	11,967	12,305	10,395	10,457	5,710	5,922	6,174	71,303	101.1
6. Cash - at End of Year	-0-	403	-0-	110	112	62	107	296	452	805		
Increase in Cash During the Period											805	1.1

January 29, 1973

TABLE 32

KOREA

FIRST PORT PROJECT

Port of Mukho

Revenues, Expenses and Net Income

1972 - 1981

(Won millions)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
I. OPERATING REVENUES:										
Port Dues	12.0	13.0	141.0	150.3	315.9	342.6	365.4	388.2	411.0	436.2
Light Dues	2.5	2.7	-	-	-	-	-	-	-	-
Dockage	7.6	8.1	95.7	109.8	122.7	169.2	177.0	186.9	196.8	204.6
Service Charge	-	-	-	-	2.5	2.5	2.5	2.5	2.5	2.5
Wharfage	-	-	77.0	82.2	87.4	124.8	133.1	141.5	149.9	159.2
Transit Shed Charge	2.2	2.4	-	-	-	-	-	-	-	-
Cargo Open Areas Charge	1.8	2.0	-	-	-	-	-	-	-	-
Demurrage (Cargo)	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Concession Fees	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1
Rentals	-	-	-	-	103.0	225.0	250.0	250.0	250.0	250.0
Miscellaneous, Tuggage, etc.	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Total Operating Revenues	38.7	40.8	326.8	355.4	644.7	877.3	941.2	982.3	1,023.4	1,065.7
II. OPERATING EXPENSE:										
Navigation Aids	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Maintenance Dredging	-	-	20.0	20.0	20.0	36.0	36.0	36.0	36.0	36.0
Port Captain Office	-	-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
General Maintenance	10.6	12.0	45.3	47.4	84.4	109.9	122.6	132.6	132.6	132.6
MOC Allocation	0.9	1.0	-	-	-	-	-	-	-	-
Special Services Tugs, etc.	-	-	22.5	23.5	24.5	25.0	25.5	26.0	26.5	27.0
Miscellaneous Dock Labor	-	-	-	-	4.0	4.0	4.0	4.0	4.0	4.0
Sundry Dock Expense	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
General and Administrative -										
Headquarters Allocation	0.7	5.8	10.5	12.9	15.0	15.0	15.0	15.0	15.0	15.0
Regional Office	37.2	48.3	49.0	49.0	30.0	30.0	30.0	30.0	30.0	30.0
Management Operations	-	-	-	-	6.0	6.0	6.0	6.0	6.0	6.0
Administration	-	-	-	-	6.0	6.0	6.0	6.0	6.0	6.0
Other	-	-	-	-	2.0	2.0	2.0	2.0	2.0	2.0
Total	37.9	54.1	59.5	51.9	59.0	59.0	59.0	59.0	59.0	59.0
Depreciation	56.0	56.0	56.0	56.0	122.2	175.5	175.5	187.5	199.5	211.5
Total Operating Expense	106.7	110.1	211.6	216.1	322.4	387.7	430.9	453.4	465.9	478.4
III. NET OPERATING REVENUE (Loss)	(68.0)	(69.3)	115.2	139.3	322.3	489.6	510.3	528.9	557.5	587.3
IV. INTEREST ON DEBT		5.2	47.3	106.5	166.1	184.3	196.4	200.4	198.5	194.8
V. NET INCOME (Loss)	(68.0)	(74.5)	67.9	32.8	156.2	305.3	313.9	328.5	359.0	392.5
VI. OPERATING RATIO	-	-	65	61	50	45	46	47	46	45
VII. TIMES INTEREST EARNED	-	-	2.4	1.3	2.0	2.6	2.6	2.6	2.8	3.0
VIII. DEBT SERVICE COVERAGE	-	-	3.6	1.8	2.7	3.6	3.5	3.2	3.1	3.3
IX. RATE OF RETURN	-	-	4.5	5.6	14.2	9.6	7.6	7.6	7.9	8.1

TABLE 33

KOREA

FIRST PORT PROJECT

Port of Mukho

Estimated Balance Sheet Data

1973 - 1981

(Won Millions)

	1973	1974	1975	1976	1977	1978	1979	1980	1981
A. Assets									
1. Current Assets									
Cash	-	-	-	(166.6)	249.2	333.6	423.5	532.6	683.8
Accounts Receivable	-	-	-	64.0	87.0	94.0	98.0	102.0	106.0
Stores	-	-	-	20.0	23.0	23.0	23.0	23.0	23.0
Other	-	-	-	3.0	4.0	5.0	6.0	7.0	8.0
Total	-	-	-	(79.6)	363.2	455.6	550.5	664.6	820.8
2. Fixed Assets									
Gross Value Land	427.2	427.2	427.2	427.2	427.2	427.2	427.2	427.2	427.2
Gross Value Other	2,248.6	2,248.6	2,248.6	2,248.6	5,172.6	6,938.6	7,348.6	7,748.6	8,148.6
Accumulated Depreciation	112.0	168.0	224.0	346.2	521.7	697.2	884.7	1,084.2	1,295.7
Net Value Other Assets in Use	2,136.6	2,080.6	2,024.6	1,902.4	4,650.9	6,241.4	6,463.9	6,664.4	6,852.9
Total Fixed Assets in Use	2,563.8	2,507.8	2,451.8	2,329.6	5,078.1	6,668.6	6,891.1	7,091.6	7,280.1
Work in Progress	370.0	1,450.0	2,945.0	4,310.0	1,556.0	400.0	400.0	400.0	400.0
Total Fixed Assets	2,933.8	3,957.8	5,396.8	6,639.6	6,634.1	7,068.6	7,291.1	7,491.6	7,680.1
3. Total Assets	2,933.8	3,957.8	5,396.8	6,560.0	6,997.3	7,524.2	7,841.6	8,156.2	8,500.9
B. Liabilities and Equity									
1. Current Liabilities									
Accounts Payable	-	-	-	42.0	62.0	64.0	64.0	64.0	64.0
Other	-	-	-	8.0	10.0	11.0	11.0	11.0	11.0
Total	-	-	-	50.0	72.0	75.0	75.0	75.0	75.0
2. IBRD Loan	-	630.0	1,555.0	2,435.0	2,545.0	2,755.0	2,743.9	2,699.5	2,651.7
3. Equity									
Government Capital	2,933.8	3,259.9	3,741.1	3,818.1	3,818.1	3,818.1	3,818.1	3,818.1	3,818.1
Retained Earnings	-	67.9	100.7	256.9	562.2	876.1	1,204.6	1,563.6	1,956.1
Total	2,933.8	3,327.8	3,841.8	4,075.0	4,380.3	4,694.2	5,022.7	5,382.7	5,774.2
4. Total Liabilities and Equity	2,933.8	3,957.8	5,396.8	6,560.0	6,997.3	7,524.2	7,841.6	8,156.2	8,500.9
C. Ratios									
Current					5.0	6.1	7.3	8.8	10.9
Liquid					4.7	5.8	7.0	8.5	10.6
Debt/Equity		16/84	29/71	37/63	37/63	37/63	35/65	33/67	31/69

TABLE 34

May 21, 1973

KOREA

FIRST PORT PROJECT

Port of Mukho

Estimated Cash Flow Data

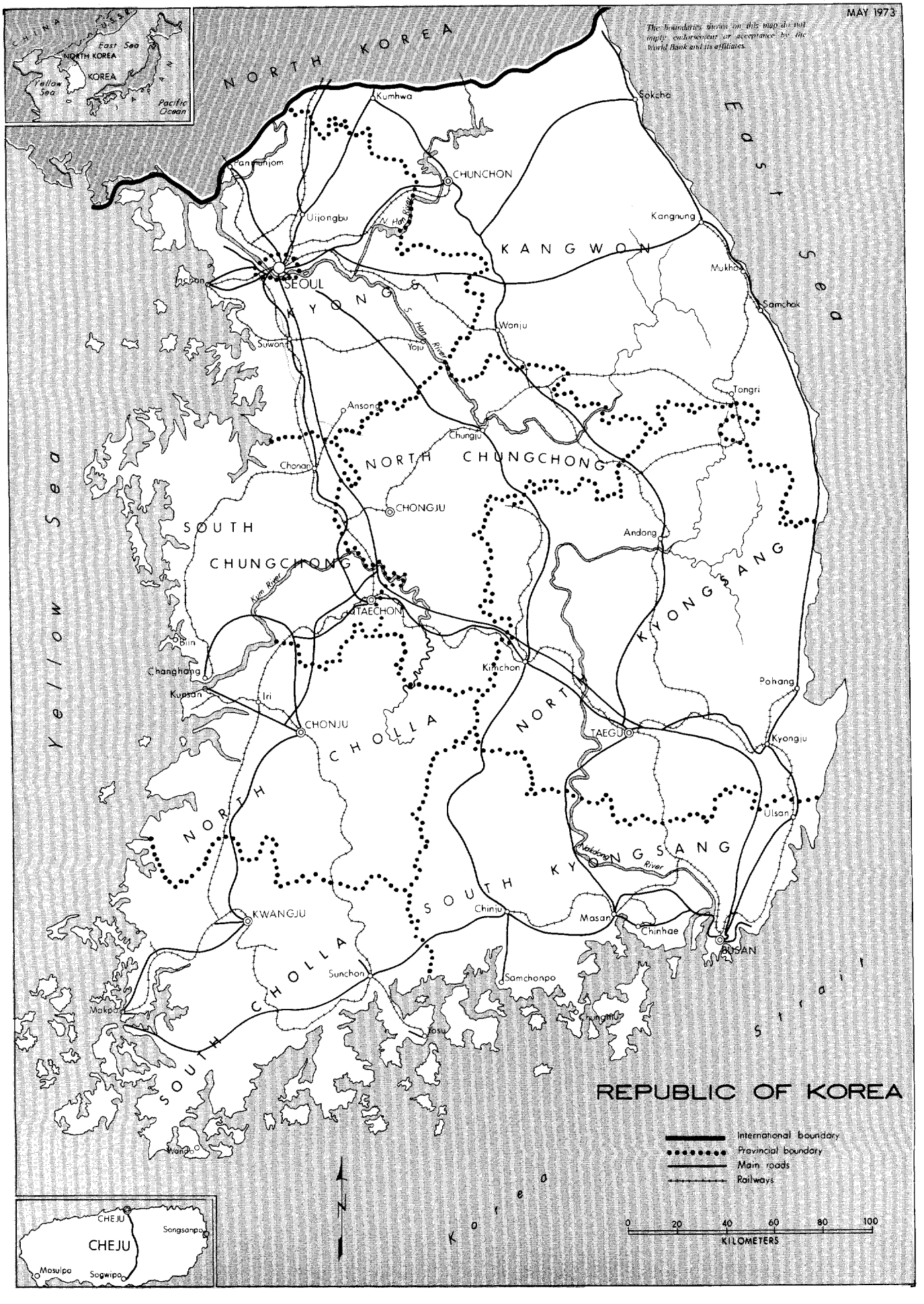
1972 - 1981

(Won millions)

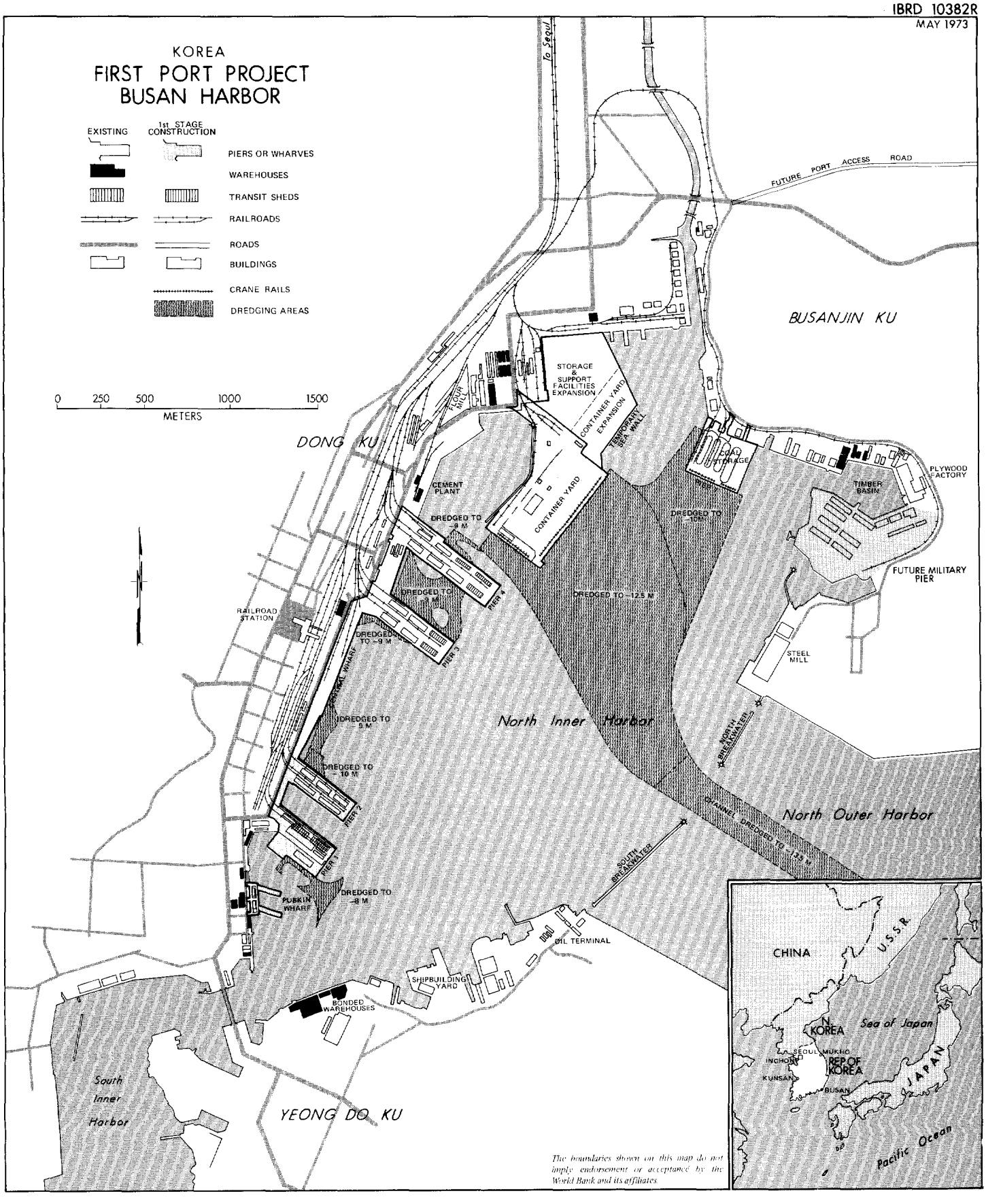
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Total 1973-1981	%
I. CASH REQUIREMENTS												
1. Capital Investments												
Project	-	-	1,080.0	1,495.0	1,365.0	170.0	210.0	10.0			4,330.0	
Other	-	-	-	-	-	-	400.0	400.0	400.0	400.0	1,600.0	
Total	-	-	1,080.0	1,495.0	1,365.0	170.0	610.0	410.0	400.0	400.0	5,930.0	80.1
2. Debt Service												
IBRD Interest	-	5.2	47.3	106.5	166.1	184.3	196.4	200.4	198.5	194.8	-	
IBRD Repayments	-	-	-	-	-	-	-	21.1	44.4	47.8	-	
Government Interest	-	-	-	-	-	-	-	-	-	-	-	
Government Repayments	-	-	-	-	-	-	-	-	-	-	-	
Total	-	5.2	47.3	106.5	166.1	184.3	196.4	221.5	242.9	242.6	1,412.8	19.1
3. Increase in Working Capital	-	-	-	-	17.0	5.0	5.0	5.0	5.0	5.0	42.0	0.6
4. Initial Purchase of Stores	-	-	-	-	20.0	-	-	-	-	-	20.0	0.2
5. Total Cash Required	-0-	5.2	1,127.3	1,601.5	1,568.1	359.3	811.4	636.5	647.9	647.6	7,404.8	100.0
II. CASH AVAILABLE												
1. Internally Generated												
Net Operating Revenues	(68.0)	(69.3)	115.2	139.3	332.3	489.6	510.3	528.9	557.5	587.3	3,191.1	
Depreciation	56.0	56.0	56.0	56.0	122.2	175.5	175.5	187.5	199.5	211.5	1,239.7	
Other	-	-	-	-	-	-	-	-	-	-	-	
Total	(12.0)	(13.3)	171.2	195.3	444.5	665.1	685.8	716.4	757.0	798.8	4,420.8	59.7
2. Government Budget Grant	12.0	18.5	326.1	481.2	77.0	-	-	-	-	-	8,902.8	12.2
3. Loans												
Proposed IBRD Loan	-	-	630.0	925.0	880.0	110.0	210.0	10.0	-	-	2,765.0	37.3
4. Cash, Beginning of Year	-	-0-	-0-	-0-	-0-	(166.6)	249.2	333.6	423.5	532.6	-	
5. Total Cash Available	-0-	-0-	1,127.3	1,601.5	1,401.5	608.5	1,145.0	1,060.0	1,180.5	1,331.4	8,088.6	109.2
6. Cash at End of Year	-0-	-0-	-0-	-0-	(166.6)	249.2	333.6	423.5	532.6	683.8		9.2
Increase in Cash During the Period Available for Further Investment Needs or Dividend Payments to Government						200.0	100.0	100.0	100.0	150.0		

May 21, 1973

TABLE 35

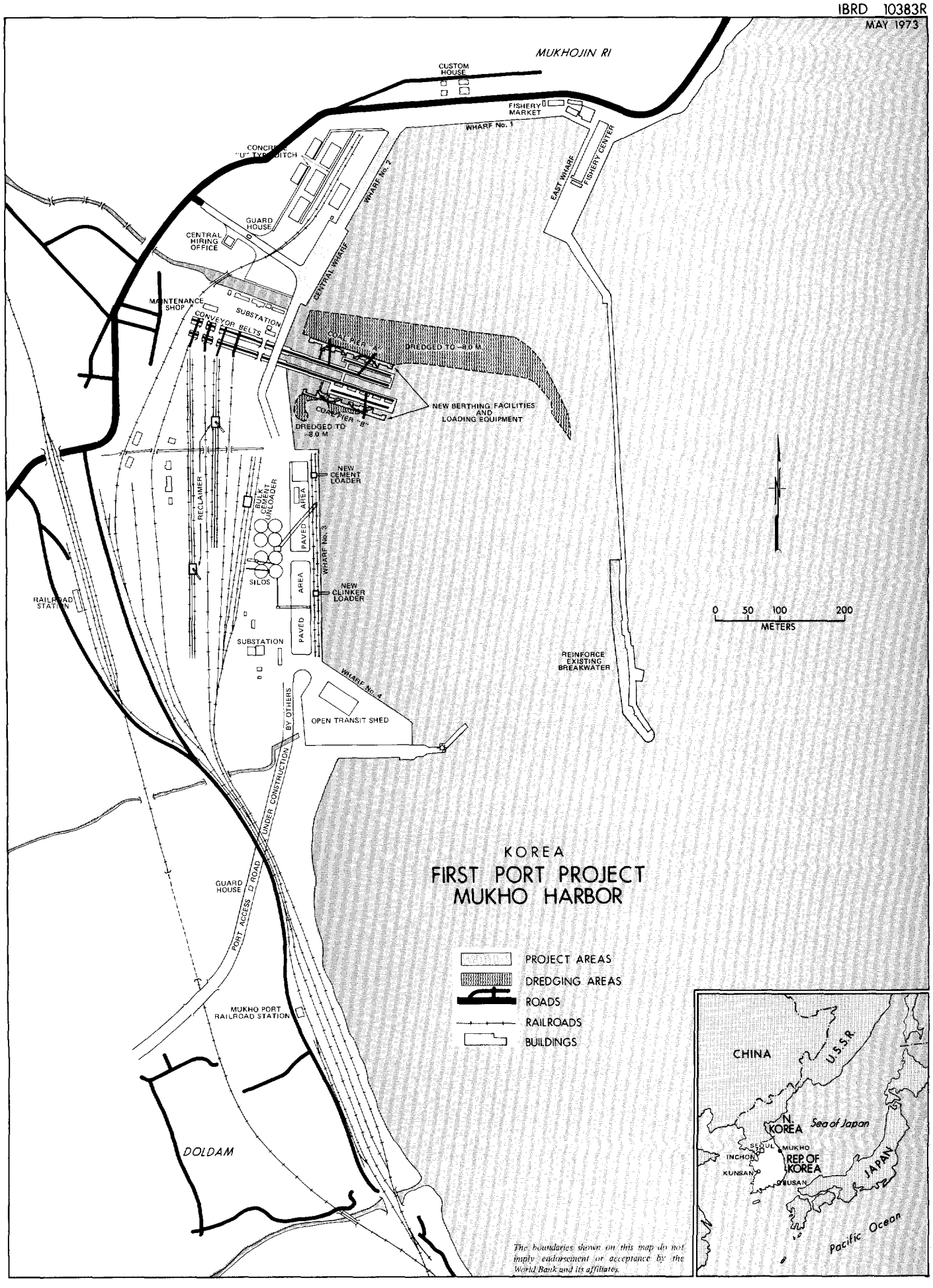

MAY 1973
The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.
CHINA
USSR
East Sea
NORTH KOREA
KOREA
Yellow Sea
Pacific Ocean
NORTH KOREA
Kumhwa
Sokcha
Panmunjom
CHUNCHON
Uijongbu
N. Han River
Kangnung
KANGWON
SEOUL
KYONGGI
S. Han River
Yoju
Wonju
Mukho
Samchok
Suwon
Tongri
Ansong
Chungju
Chonan
NORTH CHUNGCHONG
CHONGJU
Andong
SOUTH CHUNGCHONG
Kum River
TAECHON
KYONGSANG
Nonsan
Kimchon
Changhang
Pohang
Kupsan
Iri
CHONJU
TAEGU
Kyongju
NORTH CHOLLA
Ulsan
Naktong River
NORTH KYONGSANG
KWANGJU
Chinju
Masan
Chinhae
PUSAN
SOUTH CHOLLA
Sunchon
Samchonpo
Mokpo
Yosu
Chungmu
Yellow Sea
East Sea
Korea Strait
REPUBLIC OF KOREA
International boundary
Provincial boundary
Main roads
Railways
0 20 40 60 80 100
KILOMETERS
CHEJU
Songsanpo
Mosulpo
Sogwipo

IBRD 10382R
MAY 1973

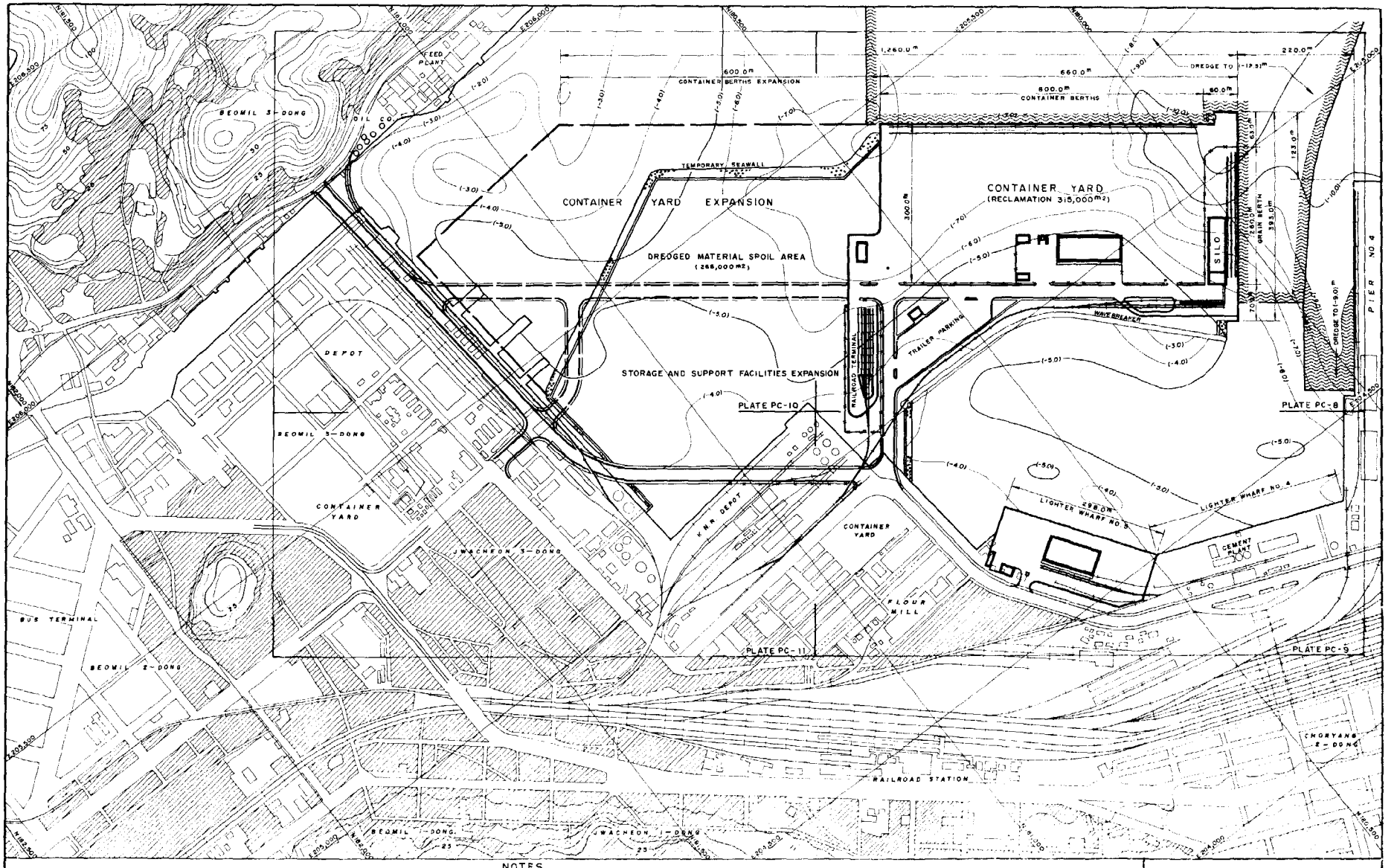


The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.

IBRD 10383R
MAY 1973



The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.



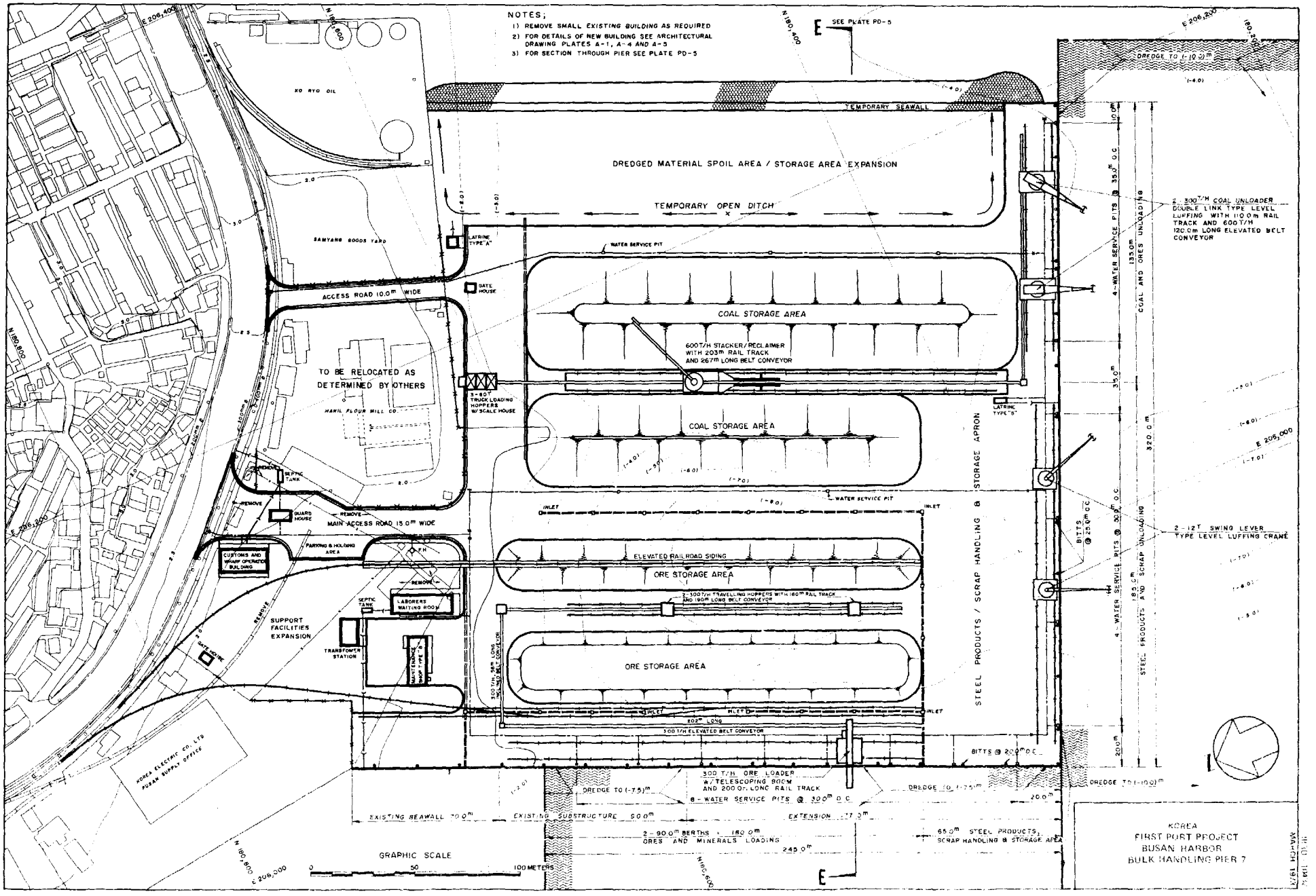
NOTES.

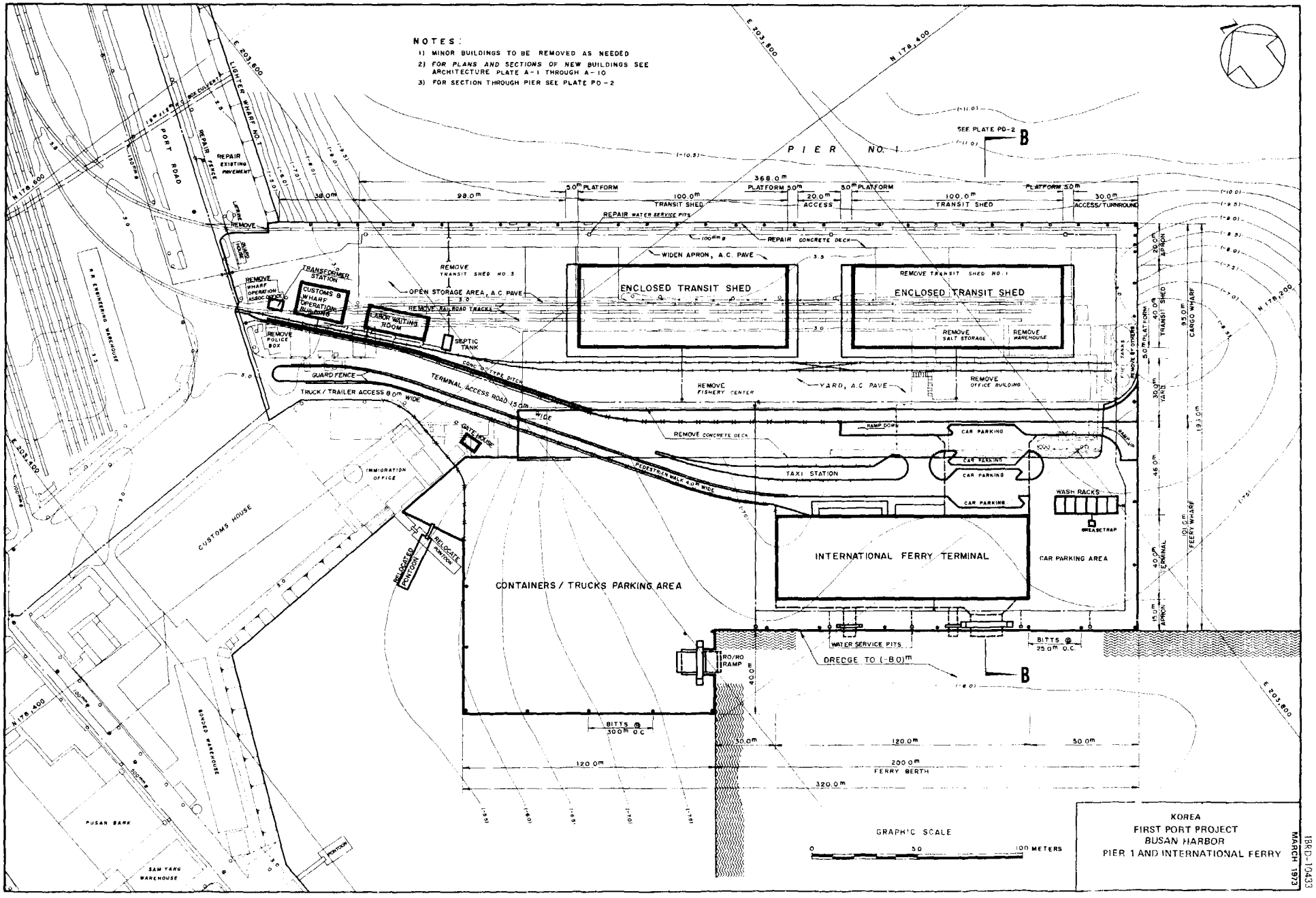
1) FACILITIES SHOWN BY DASHED LINES ARE NOT INCLUDED IN FIRST PHASE OF CONSTRUCTION
2) FOR DETAILS OF FIRST PHASE OF CONSTRUCTION SEE PLATES PC-8, PC-9, PC-10 AND PC-11

GRAPHIC SCALE : 5,000

KOREA
FIRST PORT PROJECT
BUSAN HARBOR
COMPOSIT PIER

MARCH 1973


NOTES;
1) REMOVE SMALL EXISTING BUILDING AS REQUIRED
2) FOR DETAILS OF NEW BUILDING SEE ARCHITECTURAL DRAWING PLATES A-1, A-4 AND A-5
3) FOR SECTION THROUGH PIER SEE PLATE PD-5
SEE PLATE PD-5
TEMPORARY SEAWALL
DREDGED MATERIAL SPOIL AREA / STORAGE AREA EXPANSION
TEMPORARY OPEN DITCH
DREDGE TO (-10.0)m
XO RYO OIL
SAMYANG GOODS YARD
LATRINE TYPE "A"
WATER SERVICE PIT
GATE HOUSE
ACCESS ROAD 10.0m WIDE
TO BE RELOCATED AS DETERMINED BY OTHERS
HANIL FLOUR MILL CO.
COAL STORAGE AREA
600T/H STACKER/RECLAIMER WITH 203m RAIL TRACK AND 267m LONG BELT CONVEYOR
3-80T TRUCK LOADING HOPPERS W/SCALE HOUSE
LATRINE TYPE "B"
2 - 330T/H COAL UNLOADER DOUBLE LINK TYPE LEVEL LUFFING WITH 110.0m RAIL TRACK AND 600T/H 120.0m LONG ELEVATED BELT CONVEYOR
4 - WATER SERVICE PITS @ 35.0m O.C
COAL AND ORES UNLOADING
135.0m
320.0m
35.0m
REMOVE
SEPTIC TANK
GUARD HOUSE
MAIN ACCESS ROAD 15.0m WIDE
CUSTOMS AND WHARF OPERATION BUILDING
PARKING & HOLDING AREA
F.H.
INLET
WATER SERVICE PIT
ELEVATED RAILROAD SIDING
ORE STORAGE AREA
2-300T/H TRAVELLING HOPPERS WITH 160m RAIL TRACK AND 190m LONG BELT CONVEYOR
LABORERS WAITING ROOM
SUPPORT FACILITIES EXPANSION
TRANSFORMER STATION
MAINTENANCE SHOP TYPE "B"
300 T/H, 58m LONG INCLINED BELT CONVEYOR
STEEL PRODUCTS / SCRAP HANDLING & STORAGE APRON
2 - 12T SWING LEVER TYPE LEVEL LUFFING CRANE
4 - WATER SERVICE PITS @ 30.0m O.C
STEEL PRODUCTS AND SCRAP UNLOADING
185.0m
BITTS @ 25.0m O.C
BITTS @ 20.0m O.C
202m LONG
300 T/H ELEVATED BELT CONVEYOR
KOREA ELECTRIC CO. LTD PUSAN SUPPLY OFFICE
300 T/H ORE LOADER W/TELESCOPING BOOM AND 200.0m LONG RAIL TRACK
8 - WATER SERVICE PITS @ 30.0m O.C
DREDGE TO (-7.5)m
DREDGE TO (-10.0)m
20.0m
EXISTING SEAWALL 70.0m
EXISTING SUBSTRUCTURE 90.0m
EXTENSION 87.0m
2 - 90.0m BERTHS x 180.0m ORES AND MINERALS LOADING
245.0m
65.0m STEEL PRODUCTS, SCRAP HANDLING & STORAGE AREA
GRAPHIC SCALE
0 50 100 METERS
KOREA
FIRST PORT PROJECT
BUSAN HARBOR
BULK HANDLING PIER 7


NOTES:
1) MINOR BUILDINGS TO BE REMOVED AS NEEDED
2) FOR PLANS AND SECTIONS OF NEW BUILDINGS SEE ARCHITECTURE PLATE A-1 THROUGH A-10
3) FOR SECTION THROUGH PIER SEE PLATE PD-2
PIER NO. 1
SEE PLATE PD-2
ENCLOSED TRANSIT SHED
ENCLOSED TRANSIT SHED
INTERNATIONAL FERRY TERMINAL
CAR PARKING AREA
CONTAINERS / TRUCKS PARKING AREA
CUSTOMS HOUSE
IMMIGRATION OFFICE
CUSTOMS & WHARF OPERATION BUILDING
LABOR WAITING ROOM
TRANSFORMER STATION
SEPTIC TANK
GUARD FENCE
TRUCK / TRAILER ACCESS 8.0m WIDE
TERMINAL ACCESS ROAD 15.0m WIDE
PEDESTRIAN WALK 4.0m WIDE
TAXI STATION
WASH RACKS
GREASE TRAP
OPEN STORAGE AREA, A.C. PAVE
YARD, A.C. PAVE
WIDEN APRON, A.C. PAVE
REPAIR CONCRETE DECK
REPAIR WATER SERVICE PITS
REMOVE RAILROAD TRACKS
REMOVE CONCRETE DECK
REMOVE FISHERY CENTER
REMOVE OFFICE BUILDING
REMOVE SALT STORAGE
REMOVE WAREHOUSE
REMOVE TRANSIT SHED NO. 3
REMOVE TRANSIT SHED NO. 1
REMOVE POLICE BOX
REMOVE WHARF OPERATION ASSOC. OFFICE
RELOCATE PONTOON
RELOCATED PONTOON
RO/RO RAMP
WATER SERVICE PITS
DREDGE TO (-8.0)m
BITTS @ 25.0m O.C.
BITTS @ 30.0m O.C.
200.0m FERRY BERTH
120.0m
320.0m
50.0m
PORT ROAD
LIGHTER WHARF NO. 1
REPAIR EXISTING PAVEMENT
REPAIR FENCE
N.R. ENGINEERING WAREHOUSE
BONDED WAREHOUSE
PUSAN BANK
SAM YANG WAREHOUSE
PONTOON
E 203,600
N 178,600
E 203,800
N 178,400
E 204,000
N 178,200
GRAPHIC SCALE
0 50 100 METERS
KOREA
FIRST PORT PROJECT
BUSAN HARBOR
PIER 1 AND INTERNATIONAL FERRY
IBRD-10433
MARCH 1973